DOT# 774 & 775

EVALUATION OF ROMEO - KOYJO AIR BAG SENSORS

CAR-TO-FRB TEST
OF A 1978 DODGE DIPLOMAT
TO A FIXED RIGID BARRIER
AT 9.0 AND 29.6 MPH

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TEST SUMMARY
OCOTBER 1984

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SECTION 1.0
PURPOSE AND INTRODUCTION

PURPOSE

The purpose of these crash tests was to assess the performance of the Romeo-Kojyo air bag deployment sensors. These tests were conducted when the vehicle was frontally impacted into a fixed rigid barrier.

INTRODUCTION

A 1978 Dodge Diplomat 2-door hardtop was towed into a fixed, rigid barrier on September 14, 1984. The first of the two tests was conducted at an ambient temperature of 62° F and at a velocity of 9.0 mph. Following the first test, the two energy absorbers on the front bumper were replaced with new ones. The second test was conducted at an ambient temperature of 64° F and at a velocity of 29.6 mph.

SECTION 2.0

GENERAL TEST AND VEHICLE PARAMETER DATA

The following data sheets describe the General Test and Vehicle Parameter Data.

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Chrysler Corporation

MAKE/MODEL: Dodge Diplomat VIN: GH22G8G116112

BODY STYLE: 2-Door MODEL YEAR: 1978

NHTSA NO.: R & D COLOR: Red

ENGINE DATA: TYPE: V8 CYLINDERS: 8 DISPLACEMENT 318 In^3

TRANSMISSION DATA: Automatic

DATE VEHICLE RECEIVED: 9/11/84 ODOMETER READING: 67317

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	Yes
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	No
POWER SEATS	No	TILTING STEERING WHEEL	No
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	Yes	AIR CONDITIONING	Yes
RADIO	Yes	ANTI-SKID BRAKE	No
CLOCK	No	REAR WINDOW DEFROSTER	No
OTHER			

REMARKS:

1. IS THE VEHICLE STOCK THROUGHOUT? Yes
2. DOES VEHICLE SHOW EVIDENCE OF PRIOR ACCIDENT HISTORY? No
3. DOES VEHICLE SHOW ANY SIGNIFICANT CORROSION? No
4. CONDITION OF THE FRONT/REAR BUMPER AND FRAME: Good

DATA FROM CERTIFICATION LABEL ON LEFT DOOR FACE OR "B" POST:

VEHICLE MANUFACTURED BY: Chrysler Corporation

DATE OF MANUFACTURE: 8/77

GVWR: 5125 LBS.,

GAWR: FRONT 2525 LBS., REAR 2650 LBS.

FINAL TEST WEIGHT

RIGHT FRONT	1070	LBS.	RIGHT REAR	730	LBS.
LEFT FRONT	1070	LBS.	LEFT REAR	760	LBS.
TOTAL FRONT WEIGHT	2140	LBS. (59.0 % OF TOTAL VEHICLE WEIGHT)			
TOTAL REAR WEIGHT	1490	LBS. (41.0 % OF TOTAL VEHICLE WEIGHT)			
TOTAL TEST WEIGHT	3630	LBS.			

TEST 840914A

INTENDED VELOCITY: 9.0 mph

ACTUAL VELOCITY: 9.0 mph

CENTER LENGTH MEASUREMENT

PRE-TEST: 202 5/8"

POST-TEST: 198 3/8"

CRUSH: 4 1/4"

TEST 840914B

INTENDED VELOCITY: 30.0 mph

ACTUAL VELOCITY: 29.6 mph

CENTER LENGTH MEASUREMENT

PRE-TEST: 200 3/4"

POST-TEST: 179 1/2"

CRUSH: 21 1/4"

TEST ANOMALIES

The Left Front Frame Crossmember accelerometer, FFCXGL, and the Right Front Frame Crossmember accelerometer, FFCXGR, measured accelerations which exceeded full scale for both the 9 mph and the 30 mph tests.

The cable for the Right Front accelerometer, FFCXGR, was severed after impact at approximately 50 msec on the 30 mph test.

The Firewall accelerometer, FWLXG, and the Steering Wheel Hub accelerometer, STHPG, measured accelerations which exceeded full scale on the 30 mph test.

SECTION 3.0
DATA REQUIRED BY R & D

The following pages are included in this section:

1. Vehicle accelerometer location and data summary
2. High speed camera information

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY
TEST 840914A

NO.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX (g)	POSITIVE DIRECTION TIME (msec)	NEGATIVE DIRECTION MAX (g)	NEGATIVE DIRECTION TIME (msec)
1	LEFT FRONT CROSSMEMBER (LONGITUDINAL)	180.9	-16.5	21.9	3.85	17.50 Y	19.39	47.88 Y
2	RIGHT FRONT CROSSMEMBER (LONGITUDINAL)	181.6	16.4	21.6	3.27	16.13 Y	13.29	58.75 Y
3	FIREWALL (LONGITUDINAL)	149.9	-21.0	34.5	1.51	170.88	10.52	14.38
4	STEERING WHEEL HUB (POSTERIOR)	122.3	-14.1	35.4	0.97	168.50	10.07	18.88

No visual actuation of either flashbulb occurred during the crash.

* REFERENCE: X - REAR BUMPER (+ FORWARD), Y - VEHICLE CENTERLINE (+ TO RIGHT), Z - GROUND (+ UP)

ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS IN INCHES

Y See TEST ANOMALIES

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY
TEST 840914B

NO.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX (g)	POSITIVE DIRECTION TIME (msec)	NEGATIVE DIRECTION MAX (g)	NEGATIVE DIRECTION TIME (msec)
1	LEFT FRONT CROSSMEMBER (LONGITUDINAL)	180.9	-16.5	21.9	72.91	31.25 Y	98.13	24.75 Y
2	RIGHT FRONT CROSSMEMBER (LONGITUDINAL)	181.6	16.4	21.6	26.71	32.71 Y	119.77	39.13 Y
3	FIREWALL (LONGITUDINAL)	149.9	-21.0	34.5	3.15	179.00 Y	41.36	58.75 Y
4	STEERING WHEEL HUB (POSTERIOR)	122.3	-14.1	35.4	60.95	45.63 Y	68.92	39.38 Y

Visual actuation of the flashbulb connected to the left front sensor occurred at approximately 23 milliseconds after impact.

Visual actuation of the flashbulb connected to the right front sensor occurred at approximately 55 milliseconds after impact.

* REFERENCE: X - REAR BUMPER (+ FORWARD), Y - VEHICLE CENTERLINE (+ TO RIGHT), Z - GROUND (+ UP)

ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS IN INCHES

Y See TEST ANOMALIES

HIGH SPEED CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right	Photosonic 1B	25	1000	Assess sensor performance
2	Right	Photosonic 1B	25	1000	Assess sensor performance

NOTE: CAMERAS ARE NUMBERED ACCORDING TO SPLICING SEQUENCE OF FILM.
(24 fps) REAL TIME MOVIE FILM COVERAGE OF PRE-CRASH, POST-CRASH AND CRASH EVENT SPLICED AT START AND END OF FILM.

APPENDIX A

PHOTOGRAPHS

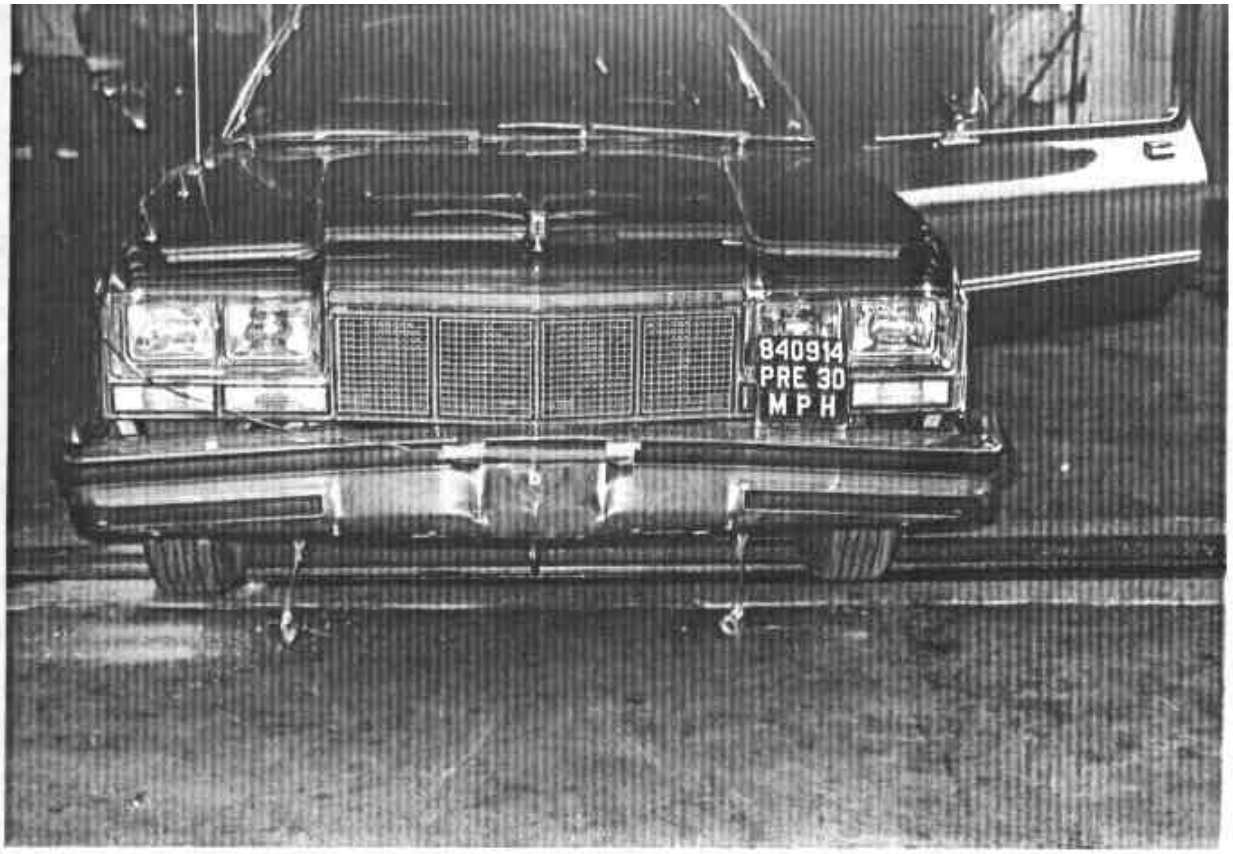


Figure A-1. PRE-TEST VEHICLE FRONT

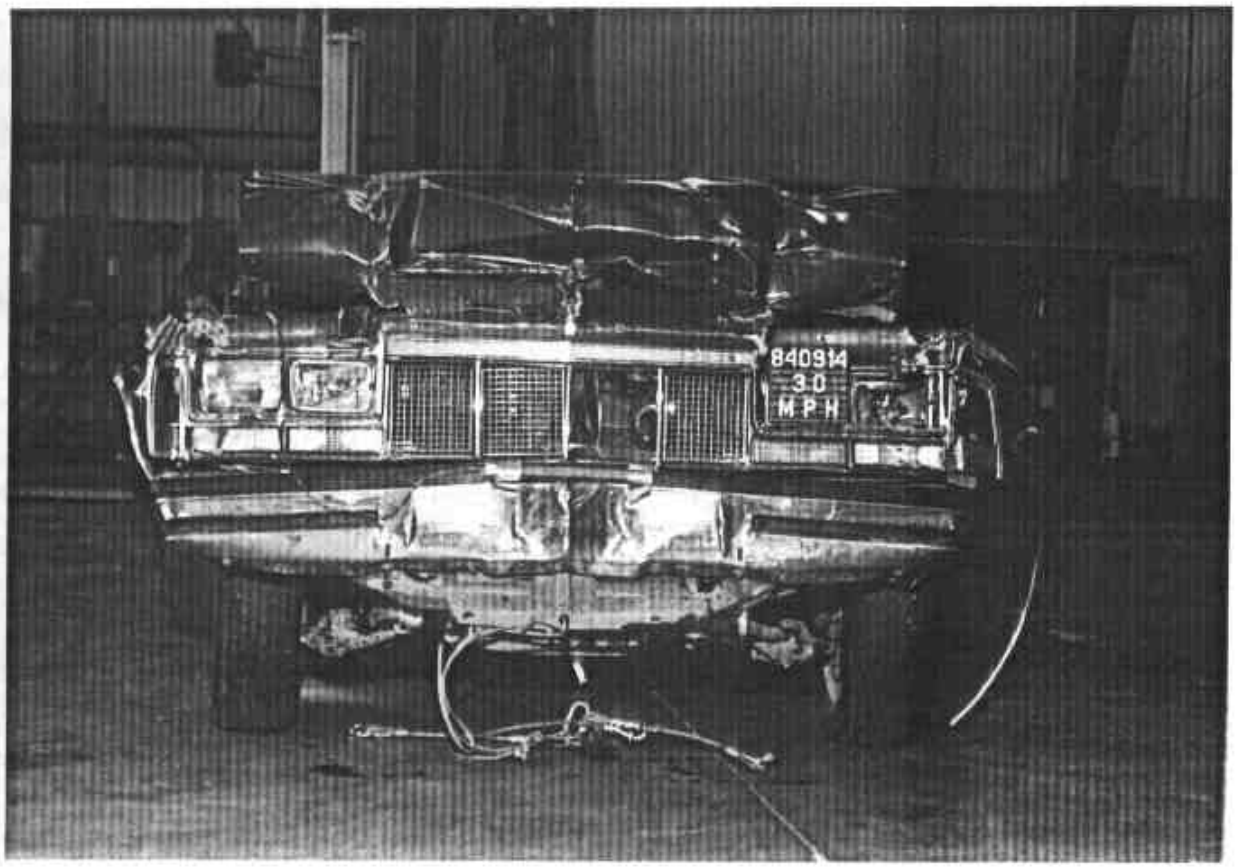
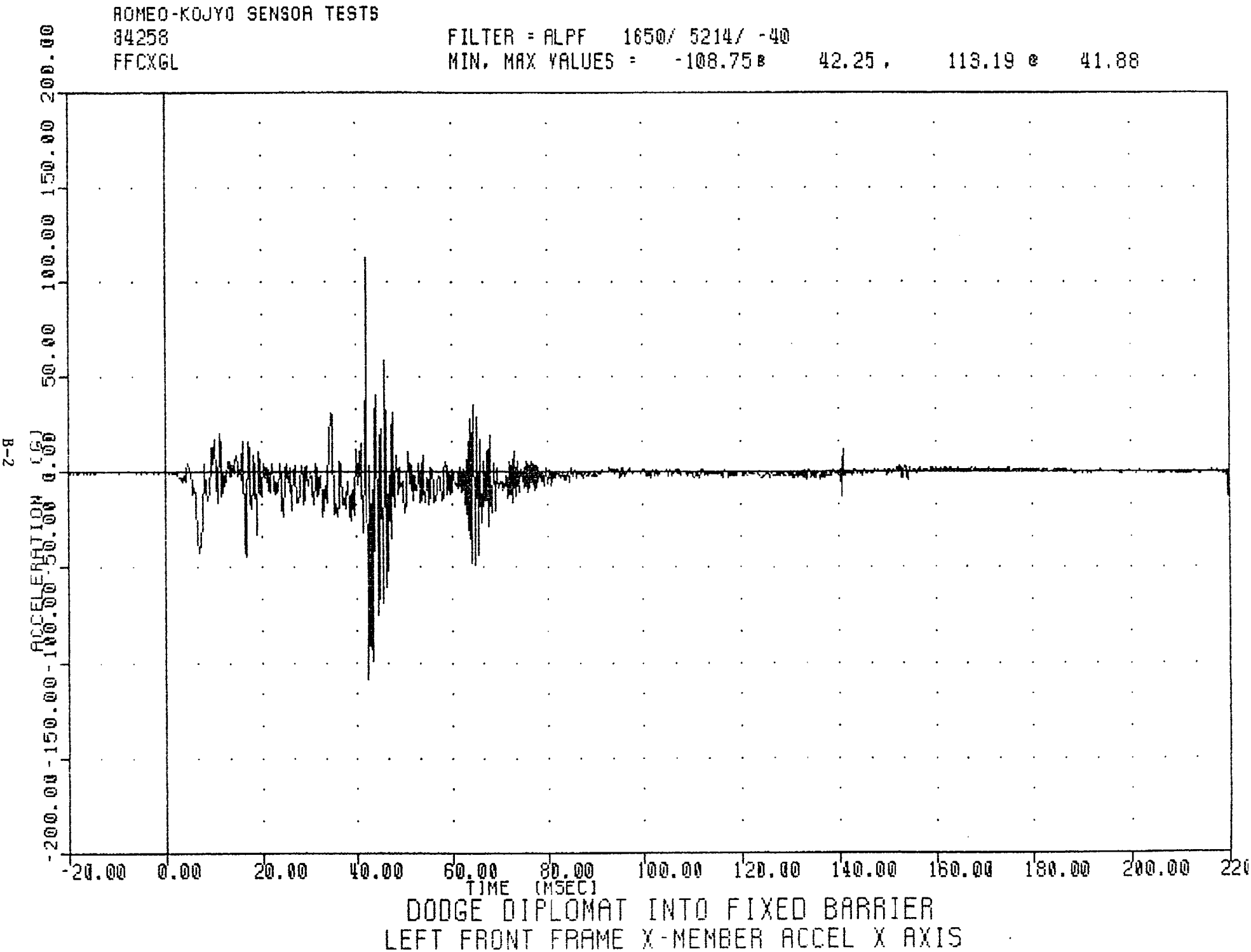


Figure A-2. POST-TEST VEHICLE FRONT

APPENDIX B

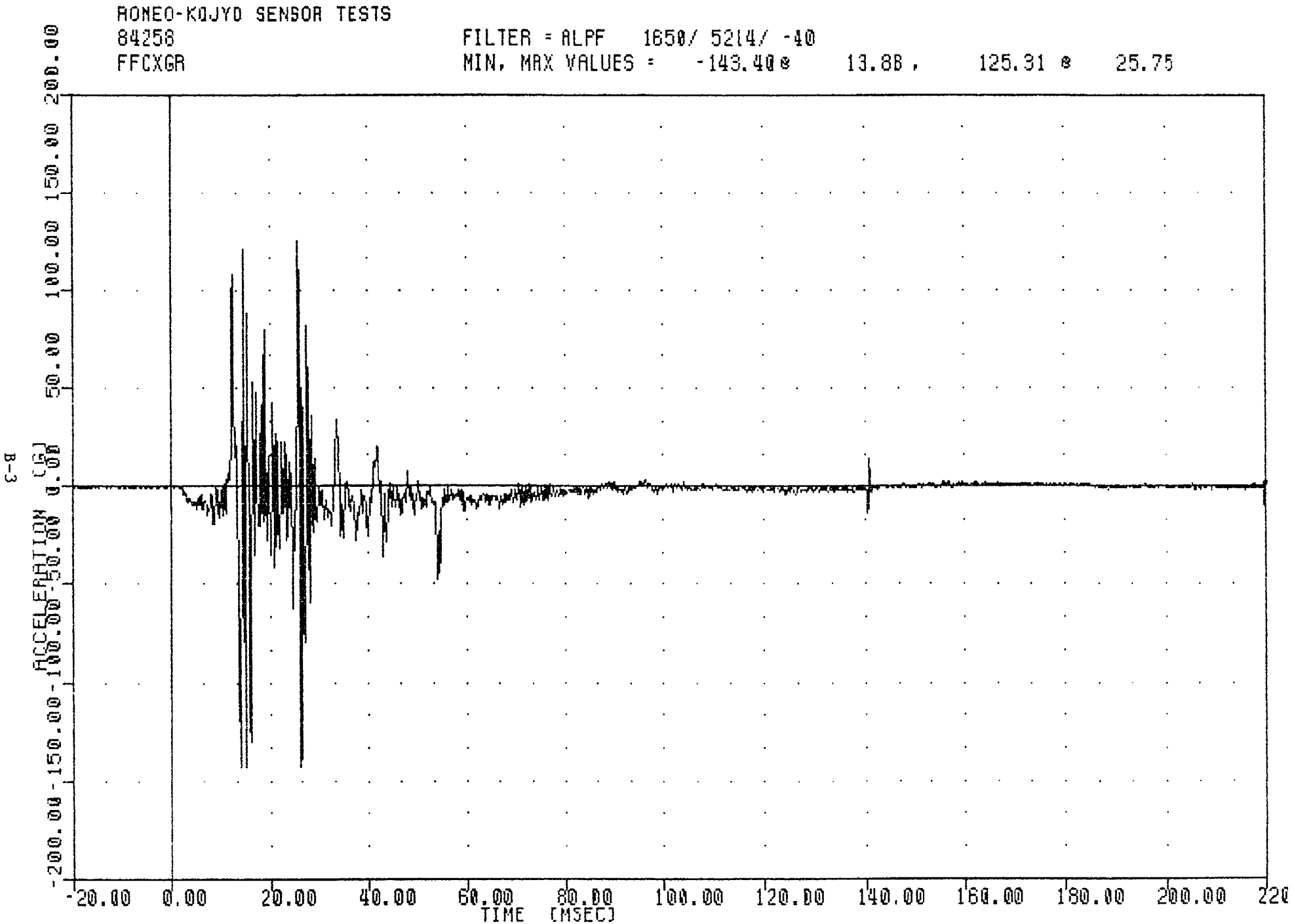
DATA PLOT PRESENTATION

Data plots generated from the crash test data are presented on the following pages. All data is unfiltered to show that accelerations exceeded full scale.

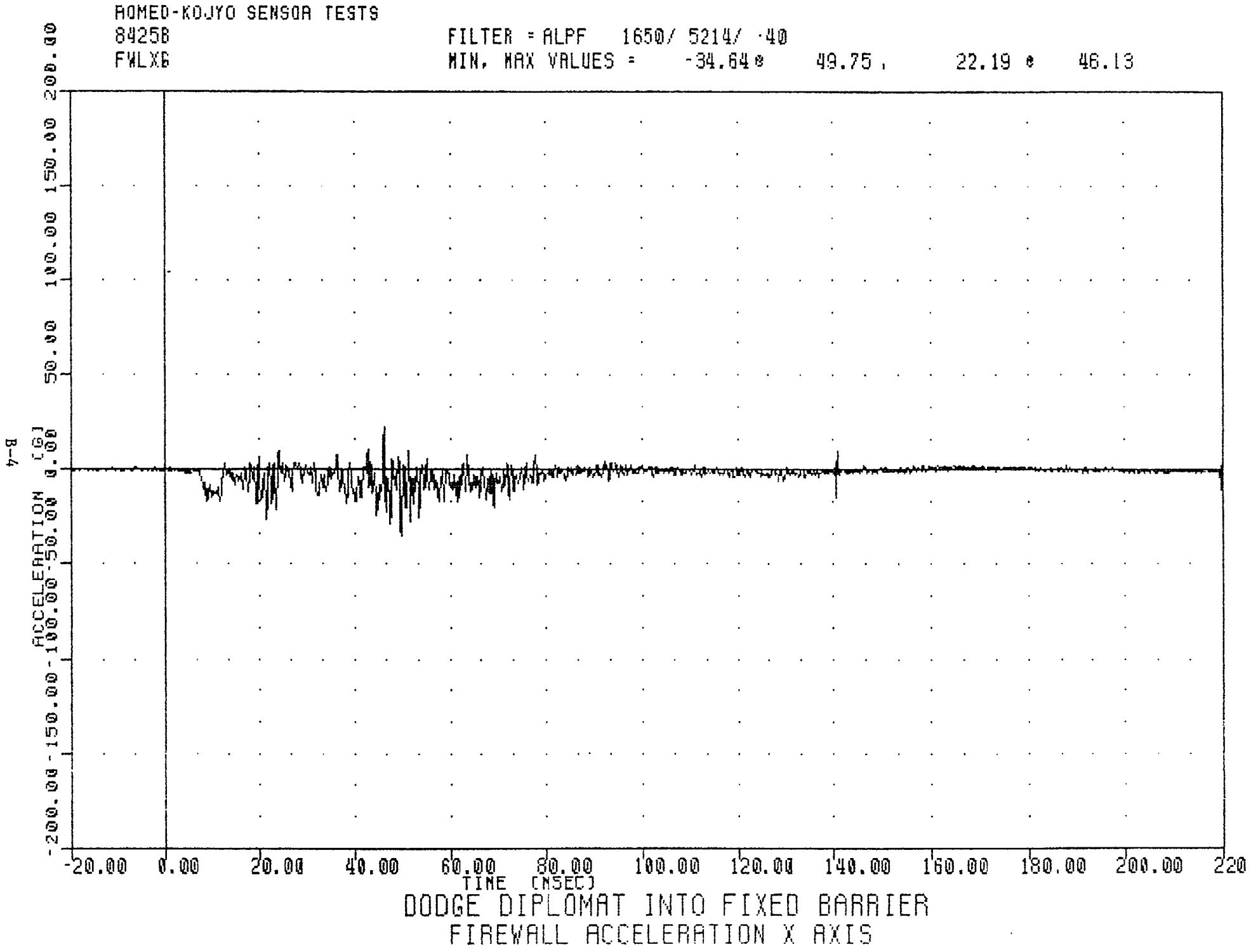


DODGE DIPLOMAT INTO FIXED BARRIER

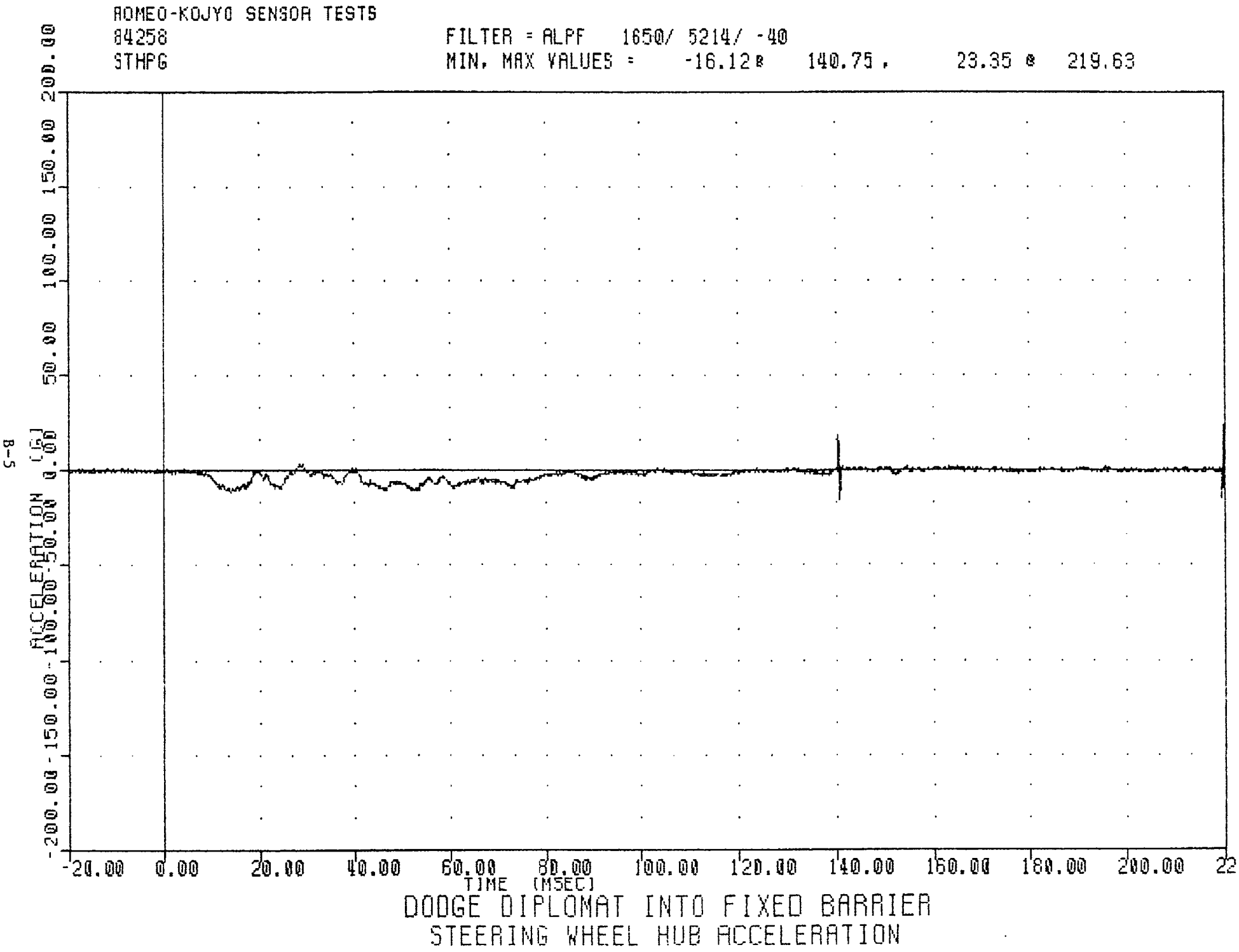
LEFT FRONT FRAME X-MEMBER ACCEL X AXIS



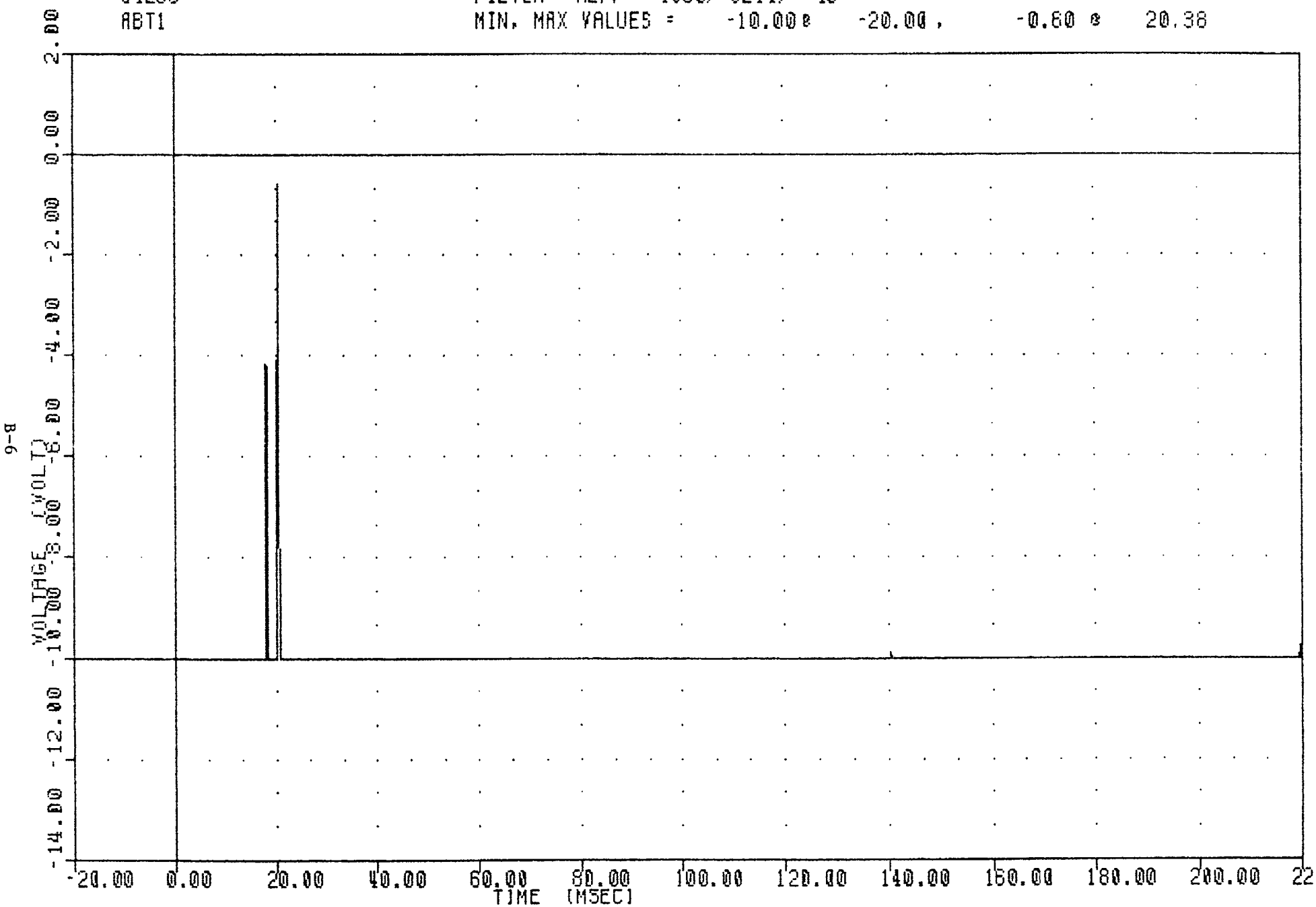
DODGE DIPLOMAT INTO FIXED BARRIER
RIGHT FRONT FRAME X-MEMBER ACCEL X AXIS



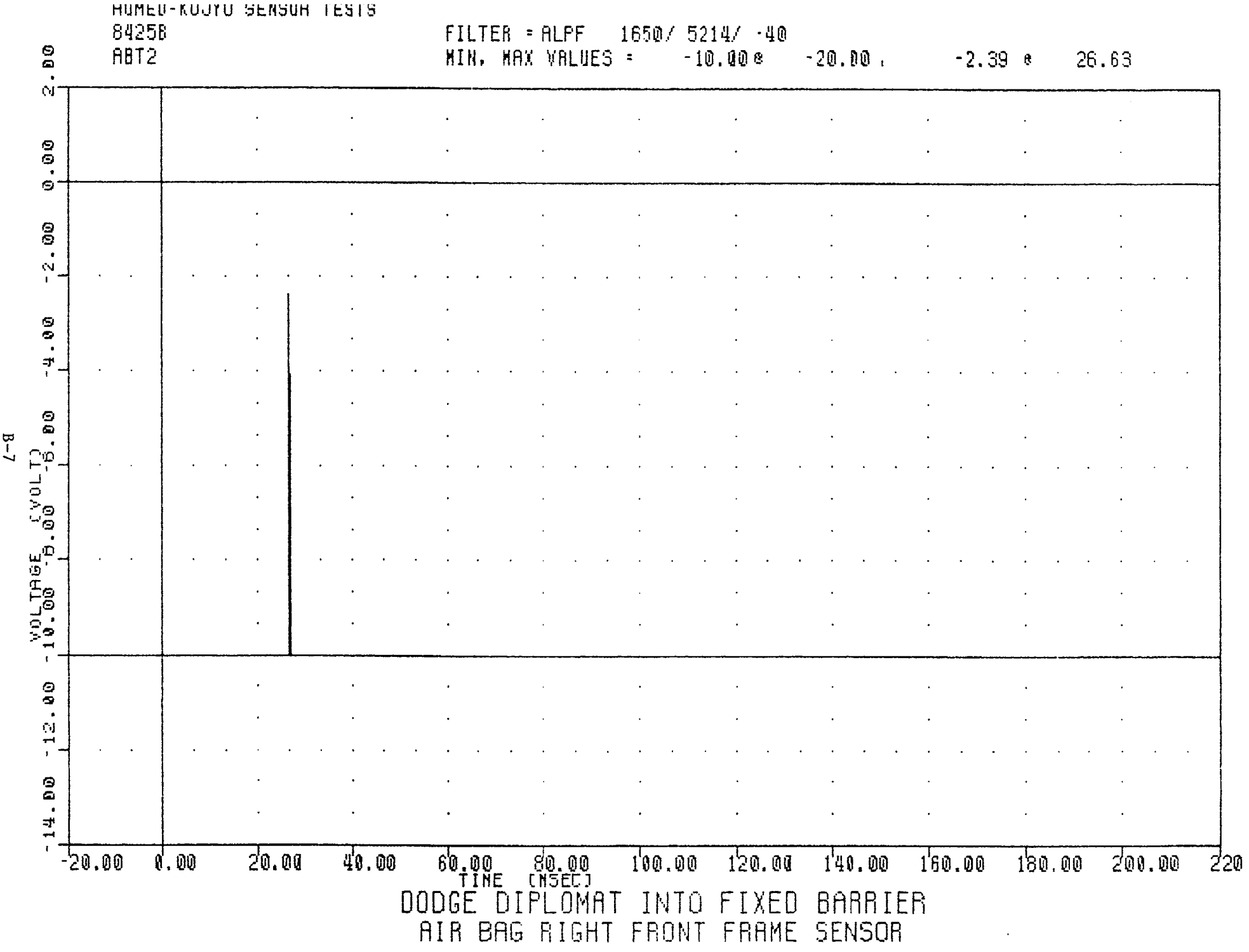
DODGE DIPLOMAT INTO FIXED BARRIER
FIREWALL ACCELERATION X AXIS



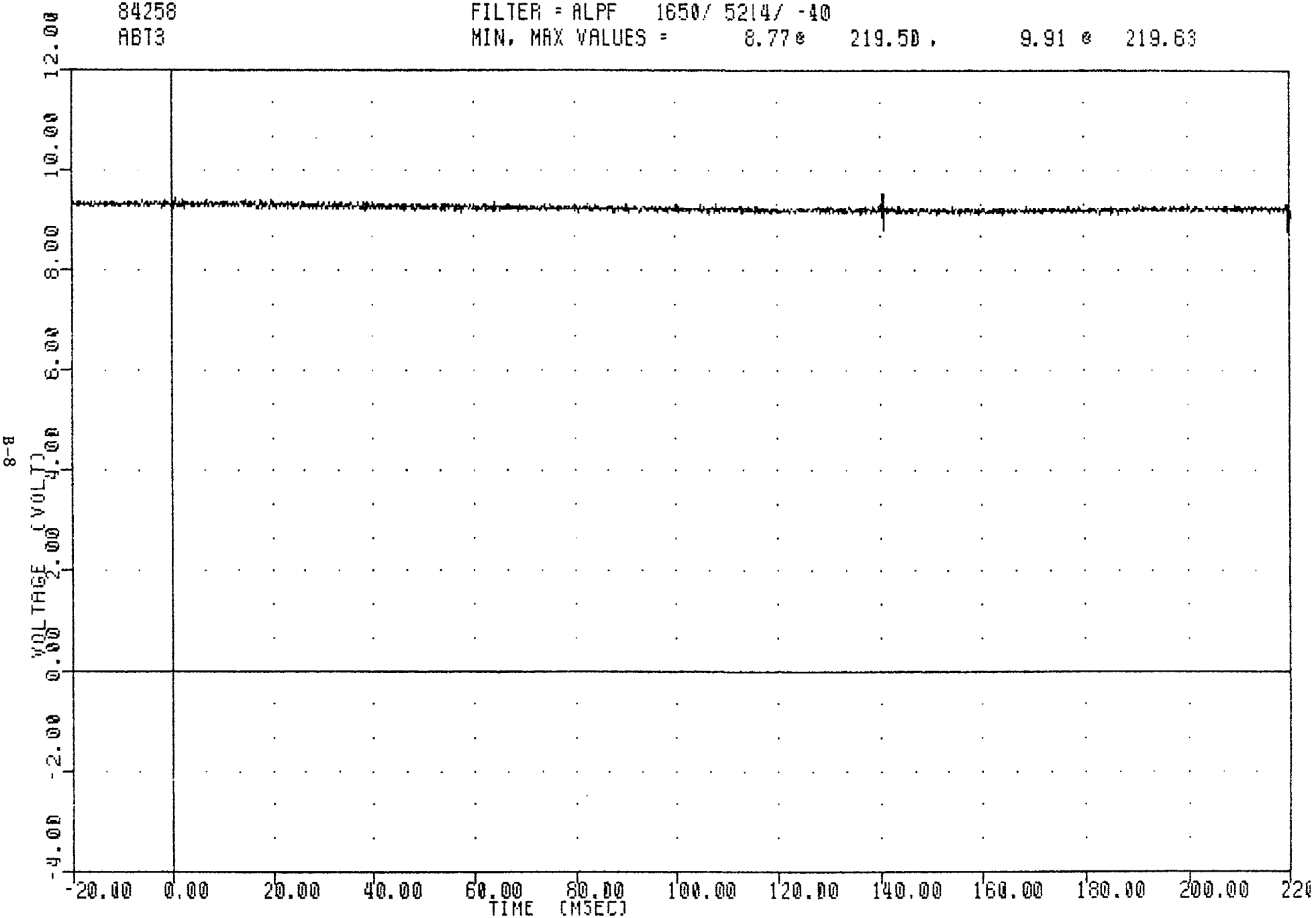
DODGE DIPLOMAT INTO FIXED BARRIER
STEERING WHEEL HUB ACCELERATION



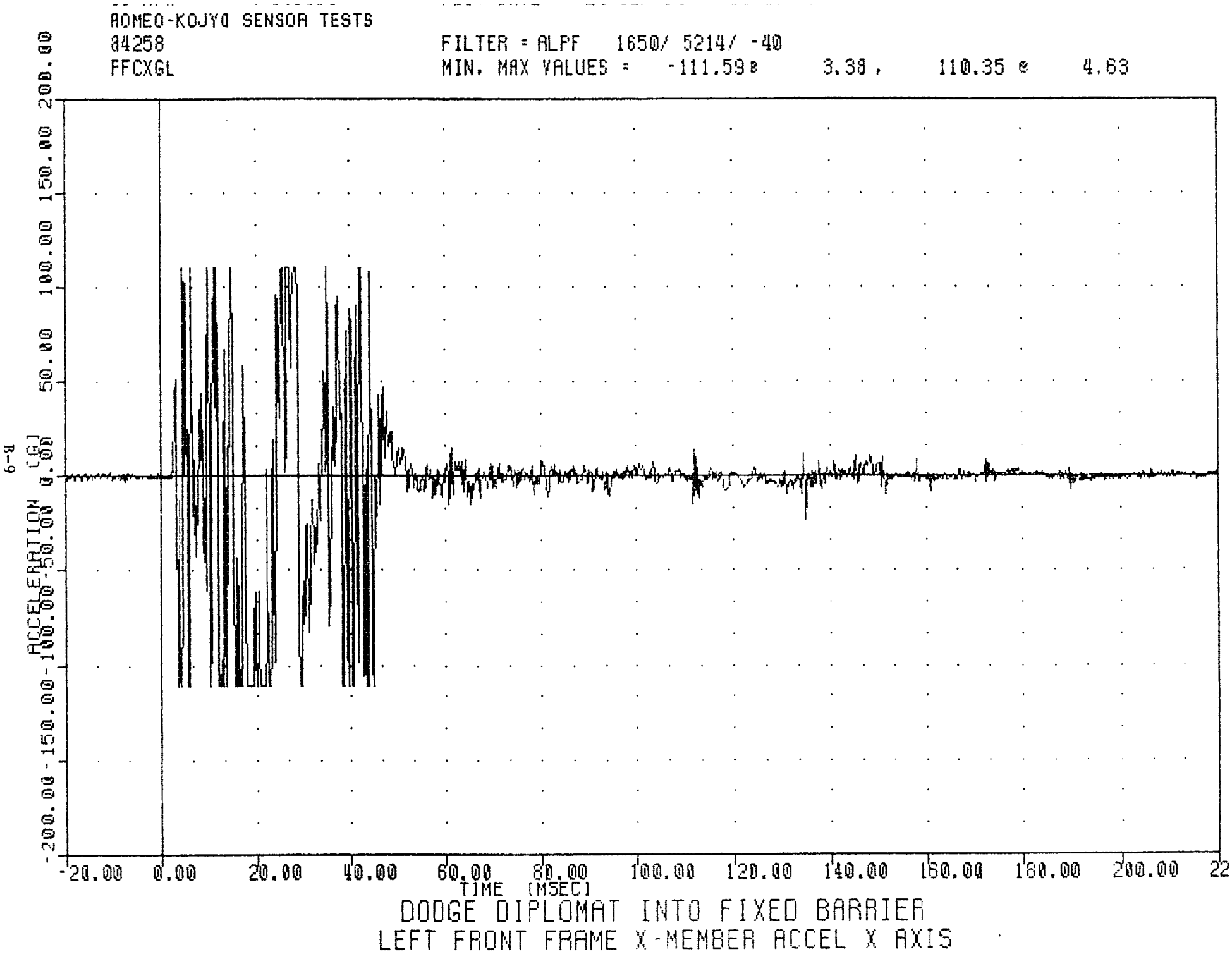
DODGE DIPLOMAT INTO FIXED BARRIER
AIR BAG LEFT FRONT FRAME SENSOR

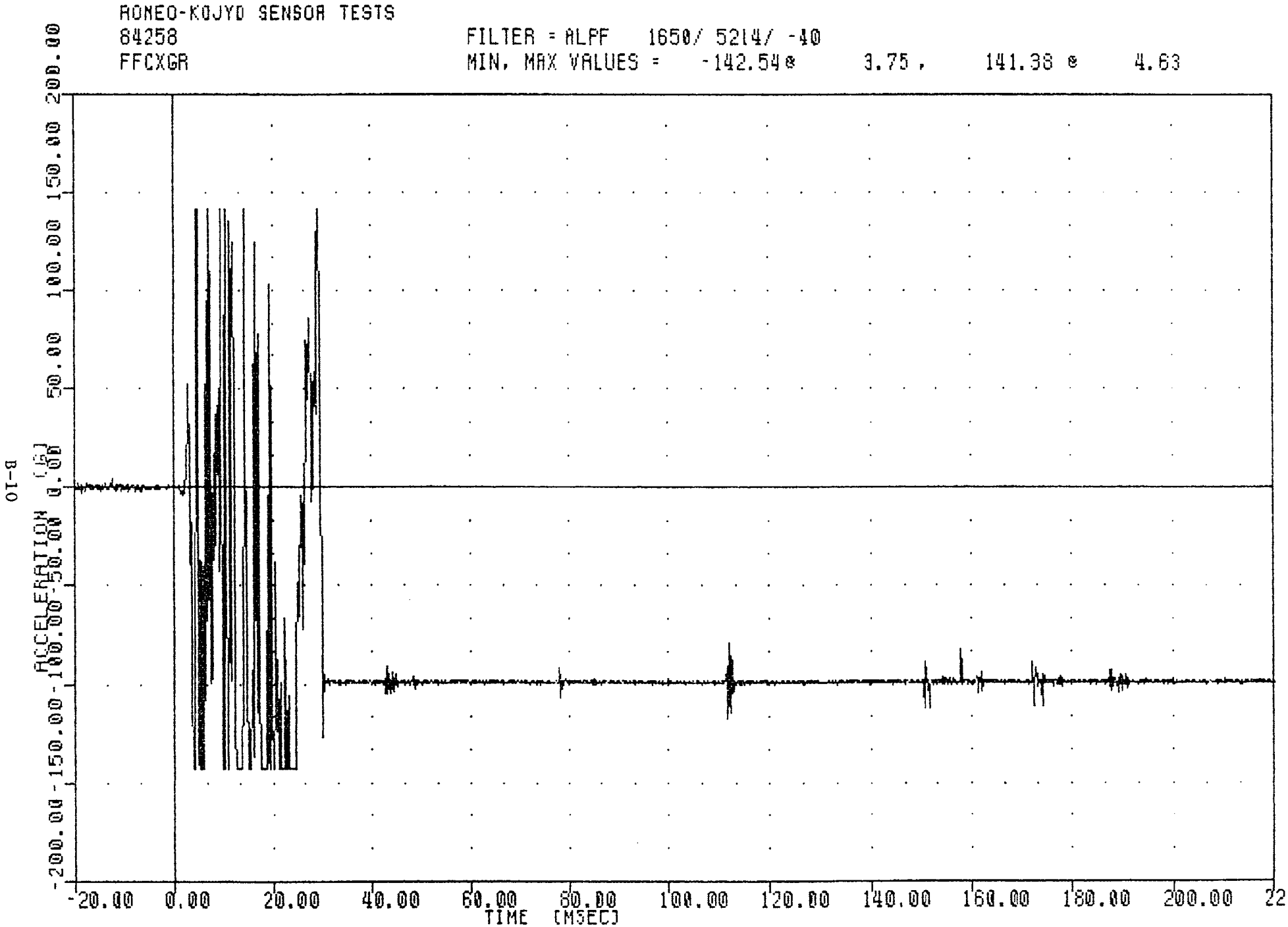


DODGE DIPLOMAT INTO FIXED BARRIER
AIR BAG RIGHT FRONT FRAME SENSOR

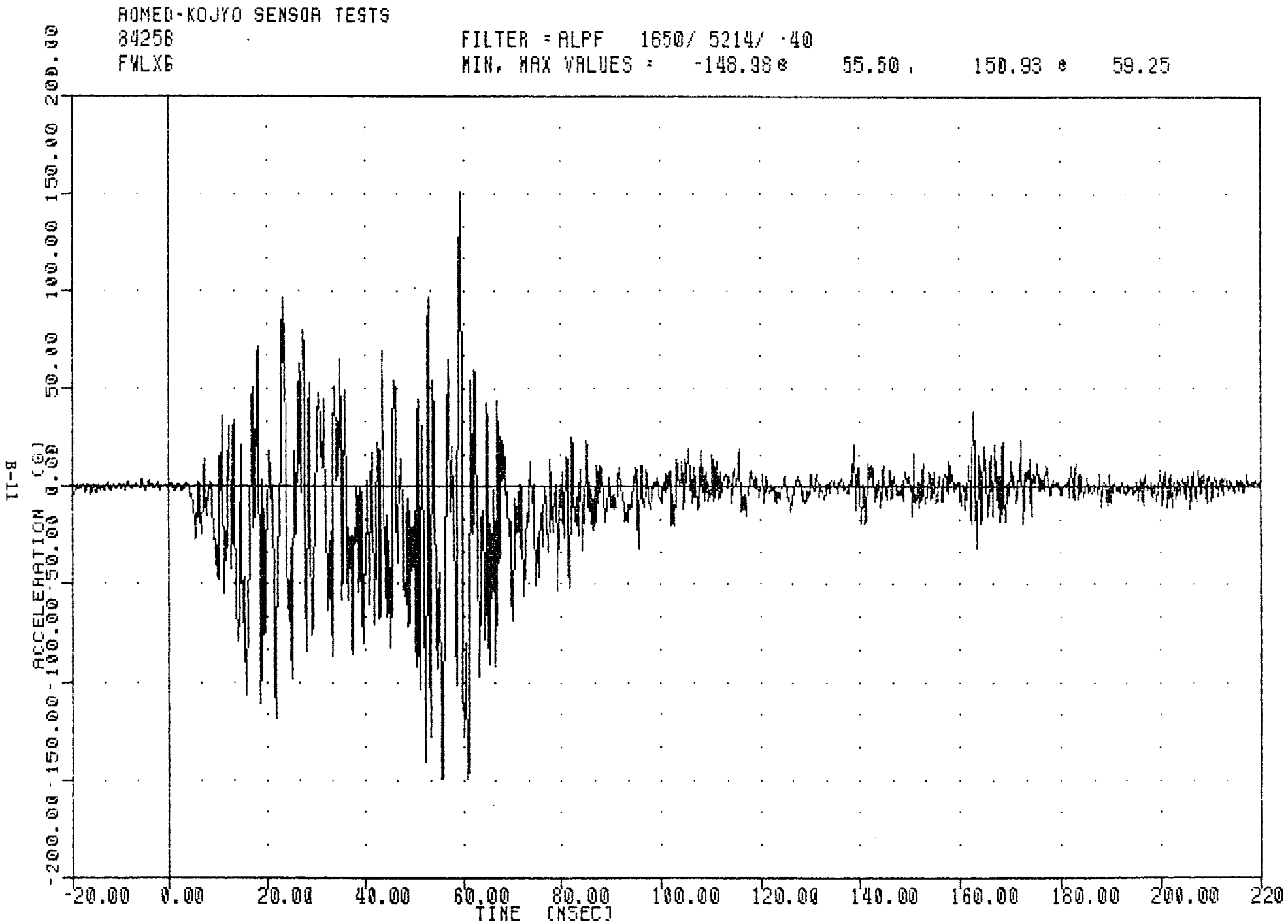


DODGE DIPLOMAT INTO FIXED BARRIER
AIR BAG SAFETY SENSOR

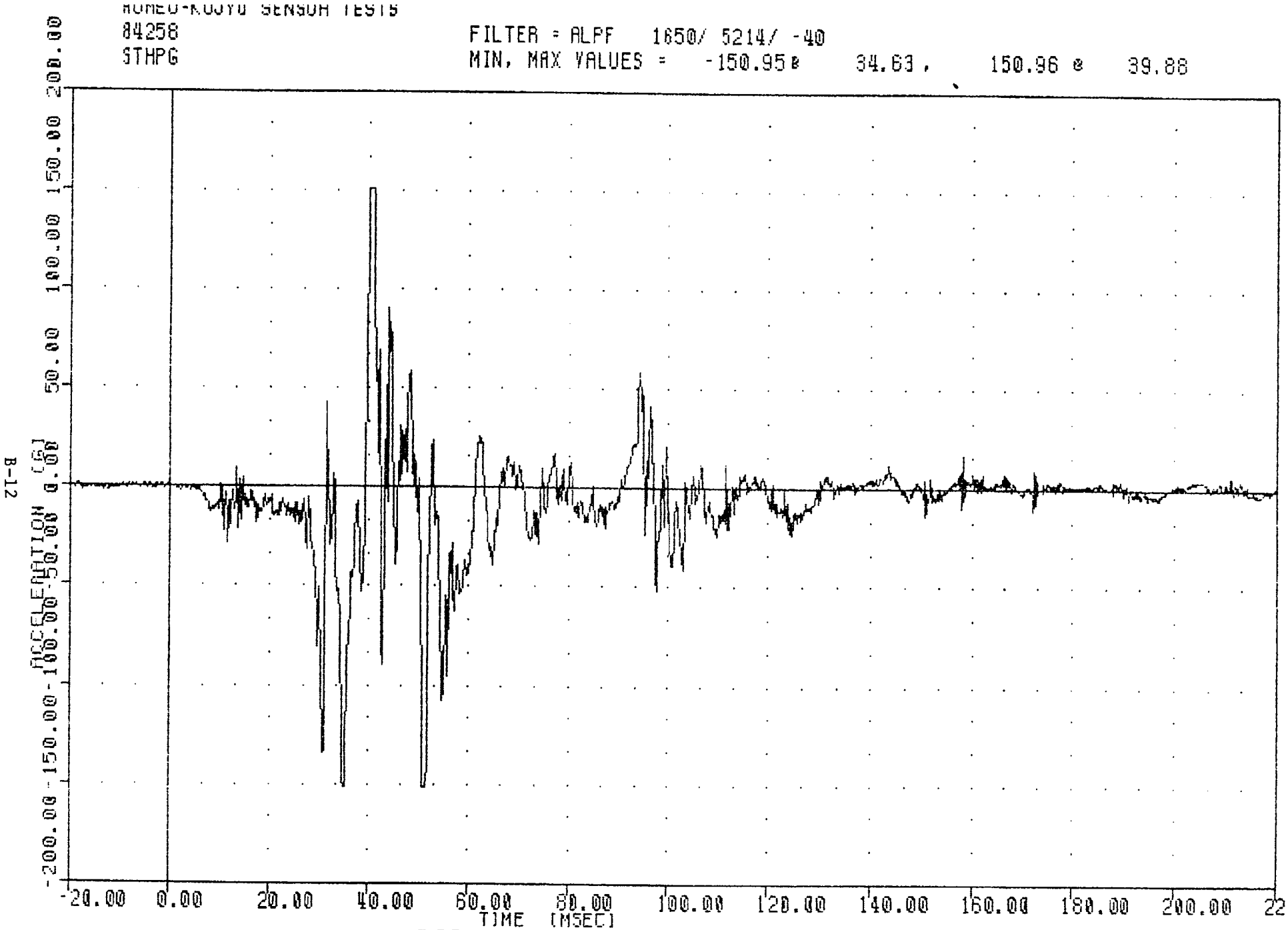

ROMEO-KOJYO SENSOR TESTS
84258
FFCXGL
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -111.59 @ 3.38 , 110.35 @ 4.63
ACCELERATION (G)
200.00
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
-200.00
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
TIME (MSEC)
DODGE DIPLOMAT INTO FIXED BARRIER
LEFT FRONT FRAME X-MEMBER ACCEL X AXIS



DODGE DIPLOMAT INTO FIXED BARRIER
RIGHT FRONT FRAME X-MEMBER ACCEL X AXIS



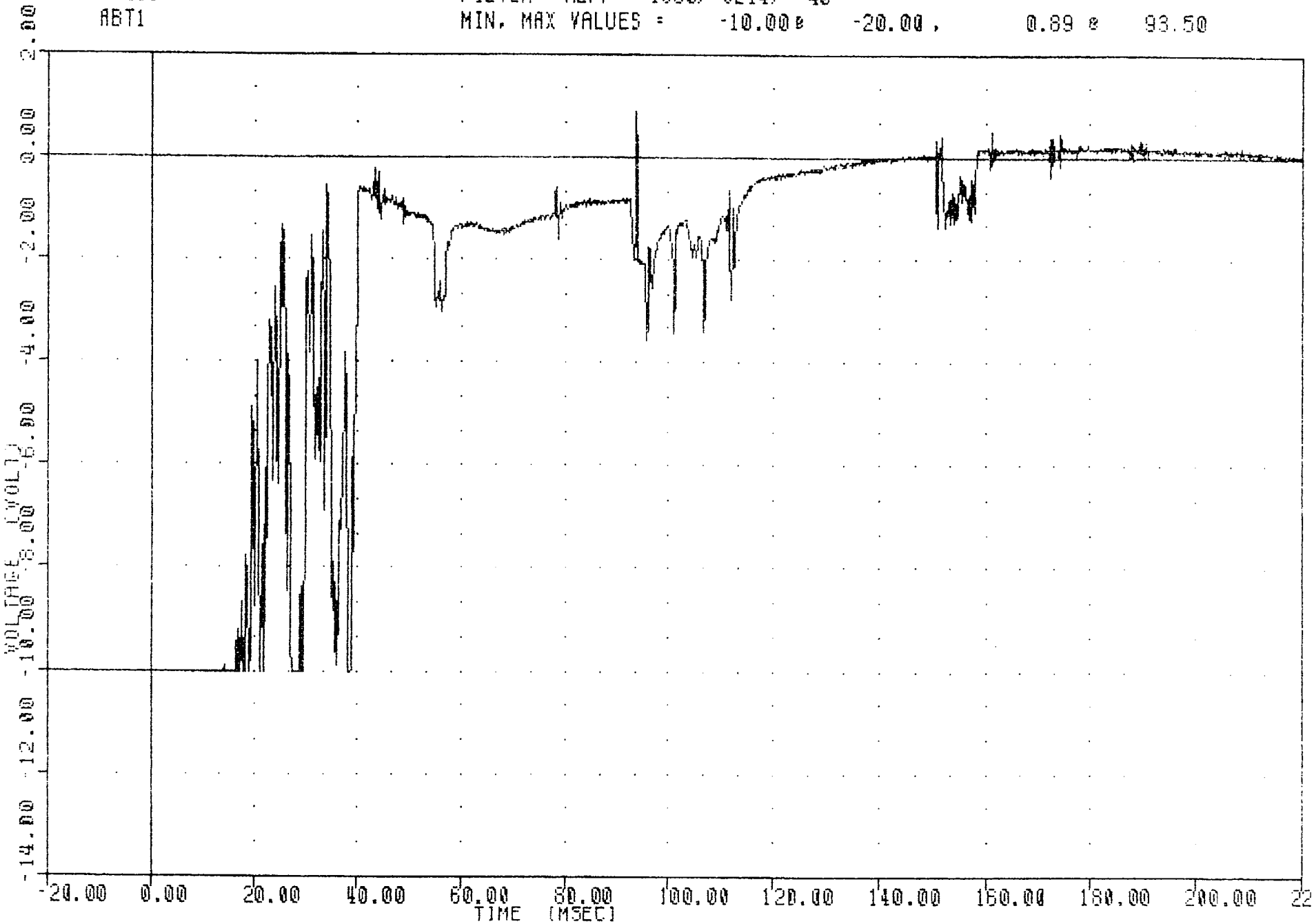
DODGE DIPLOMAT INTO FIXED BARRIER
FIREWALL ACCELERATION X AXIS



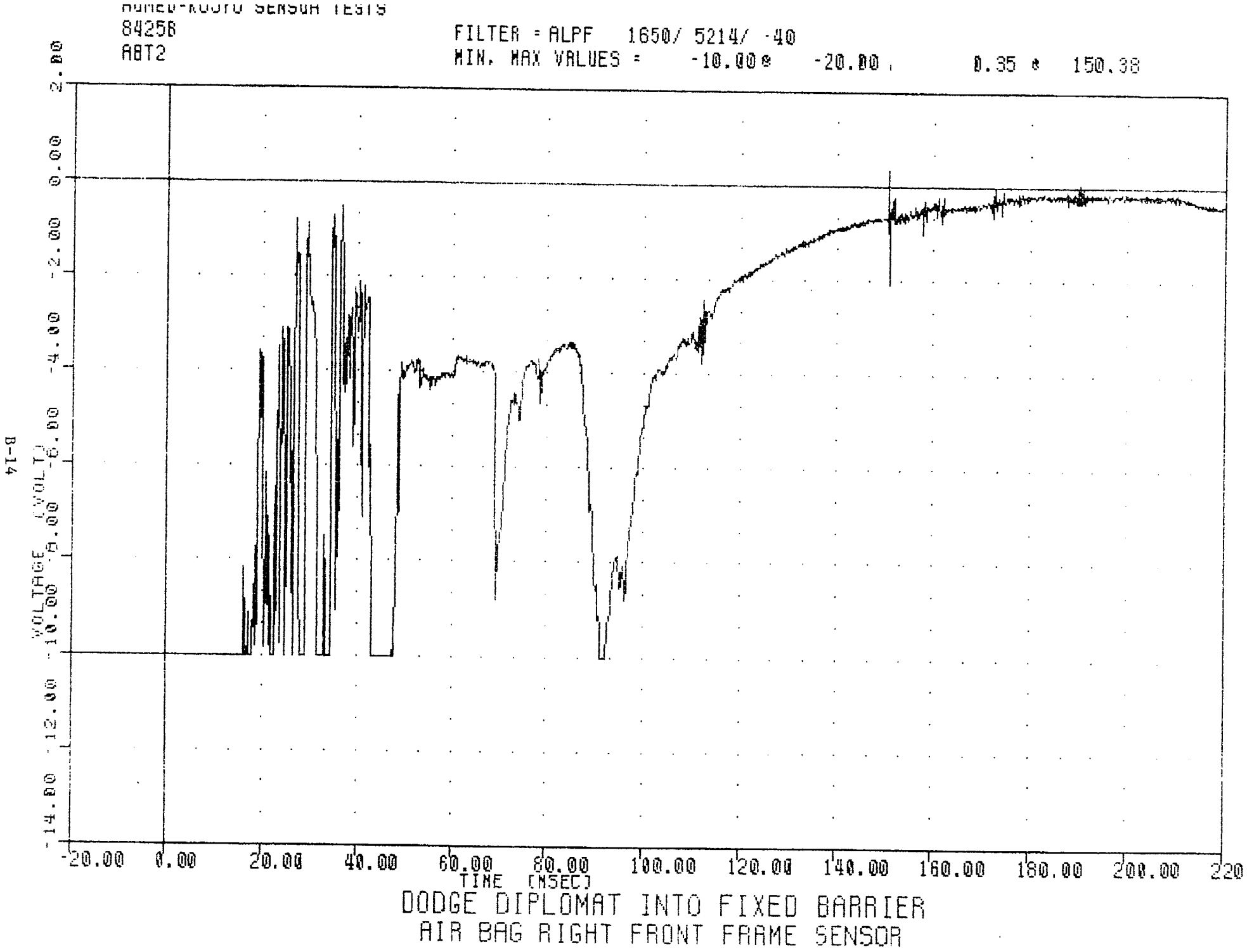
DODGE DIPLOMAT INTO FIXED BARRIER
STEERING WHEEL HUB ACCELERATION

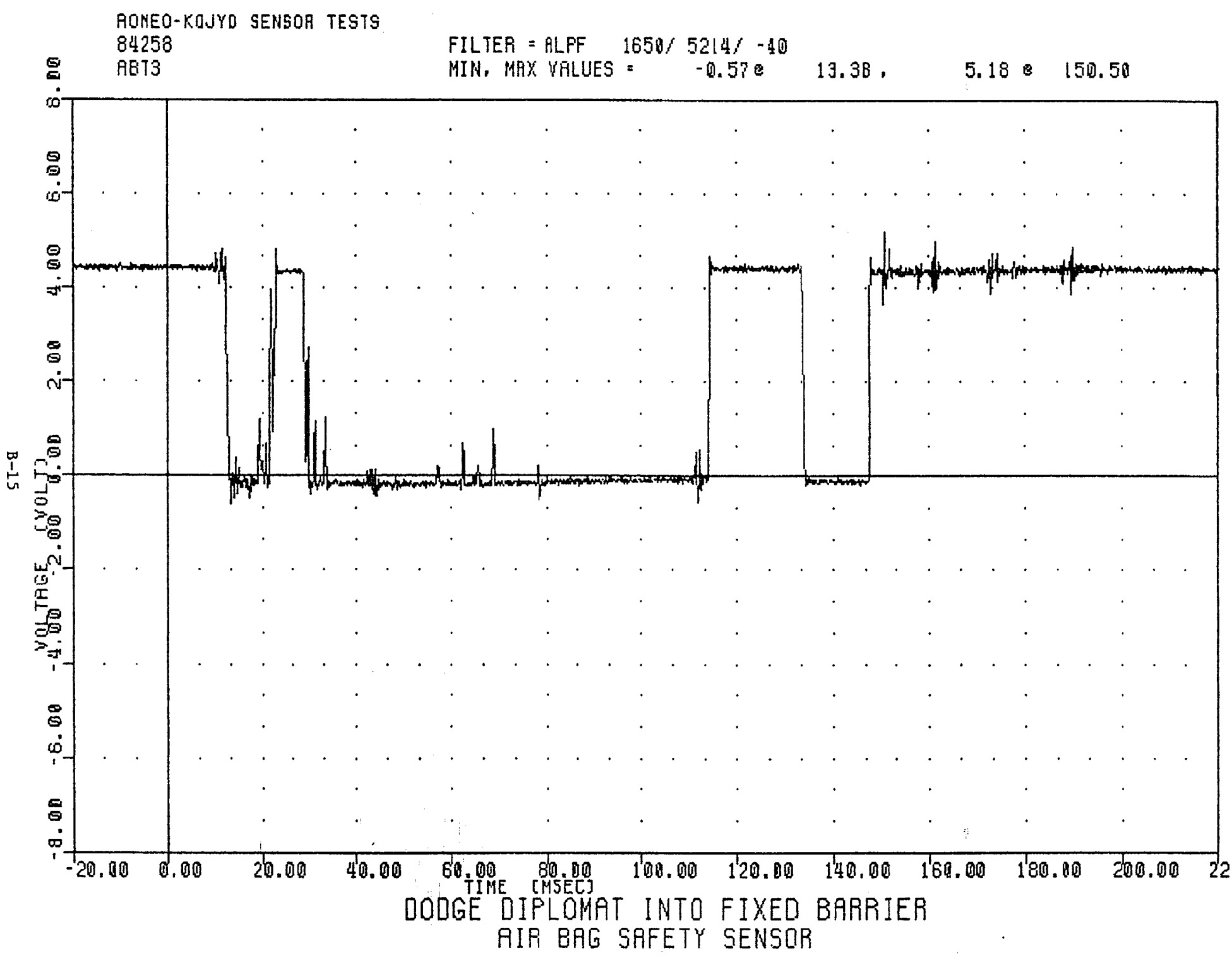
ROMEO-KOJYO SENSOR TEST5
84258
ABT1

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -10.00 @ -20.00 , 0.89 @ 93.50



DODGE DIPLOMAT INTO FIXED BARRIER
AIR BAG LEFT FRONT FRAME SENSOR


84256
ABT2
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -10.00 @ -20.00 , 0.35 @ 150.38
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
-14.00
VOLTAGE (VOLT)
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220
TIME (MSEC)
DODGE DIPLOMAT INTO FIXED BARRIER
AIR BAG RIGHT FRONT FRAME SENSOR

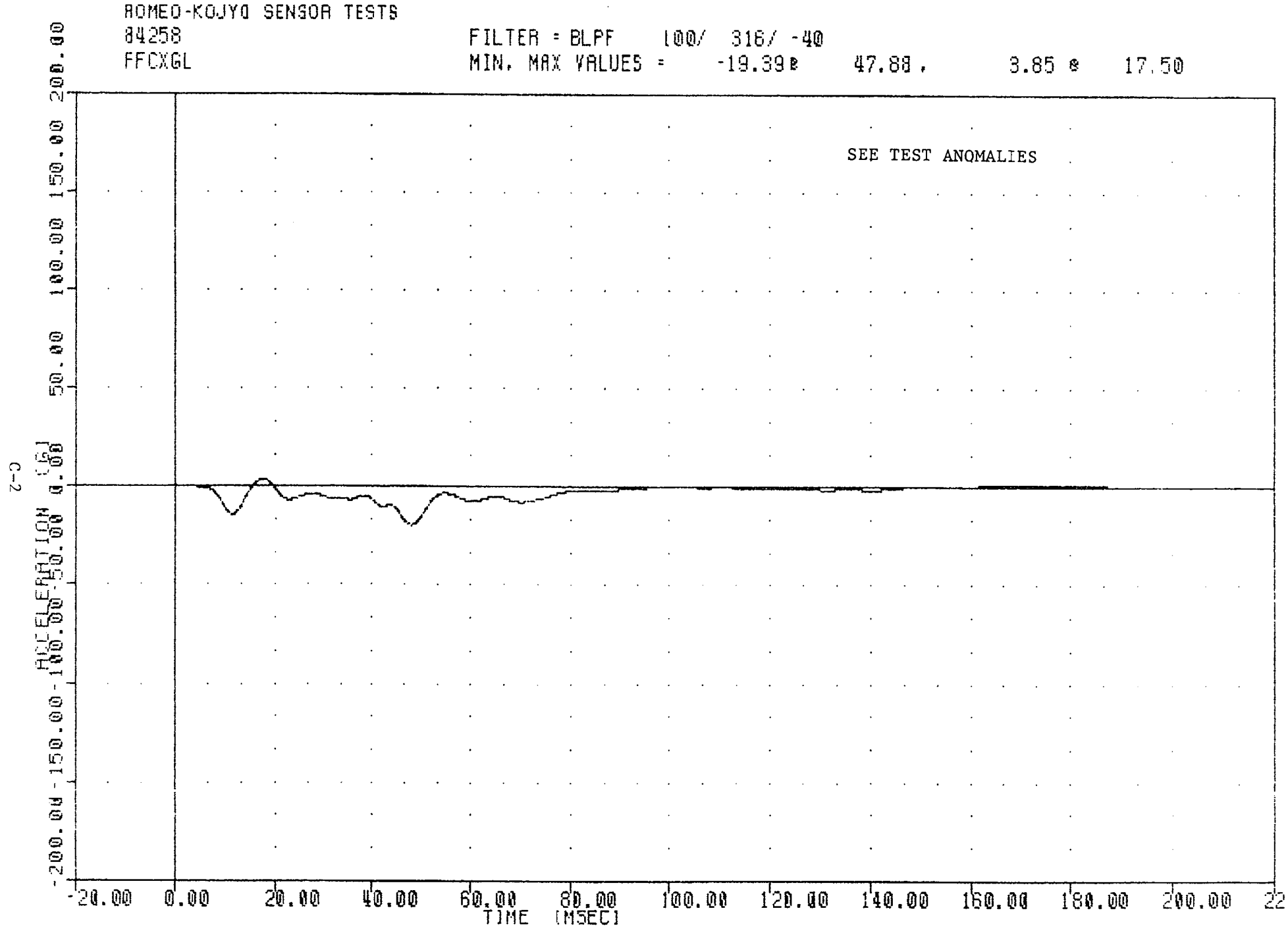


DODGE DIPLOMAT INTO FIXED BARRIER
AIR BAG SAFETY SENSOR

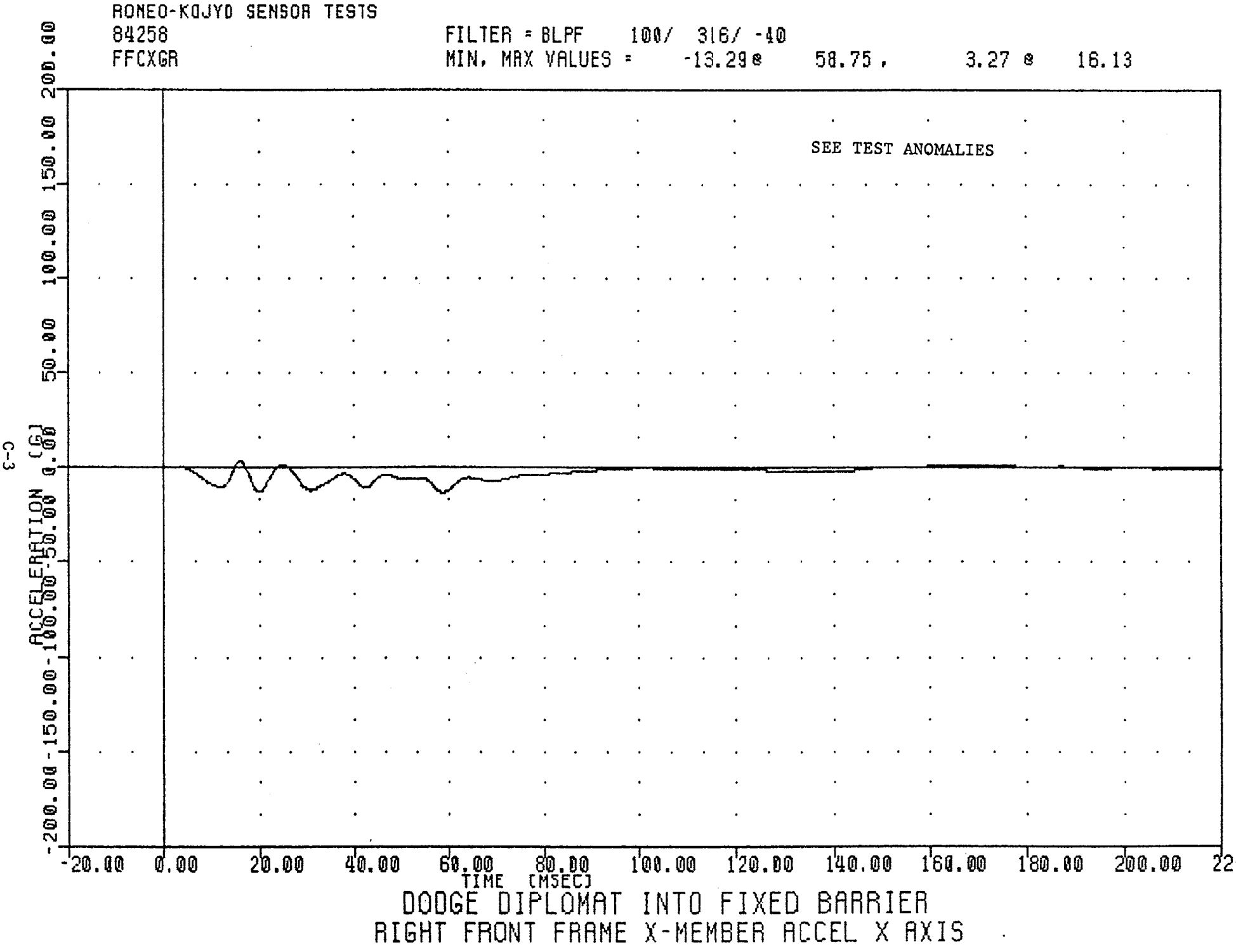
APPENDIX C

DATA PLOT PRESENTATION

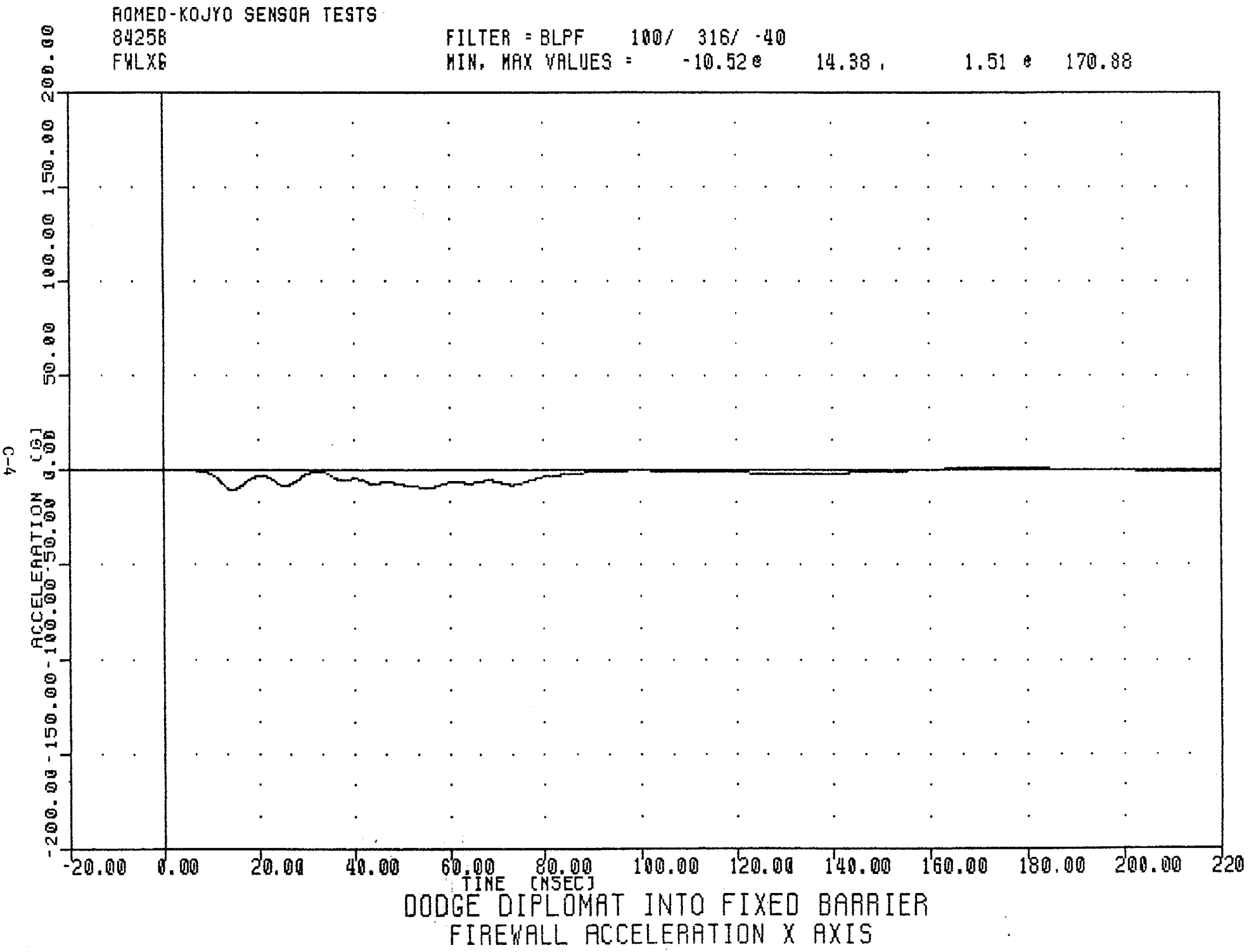
Data plots generated from the crash test data are presented on the following pages. All data is recorded on magnetic tape for inclusion in the NHTSA crash test data base system. The data was filtered according to SAE J211.



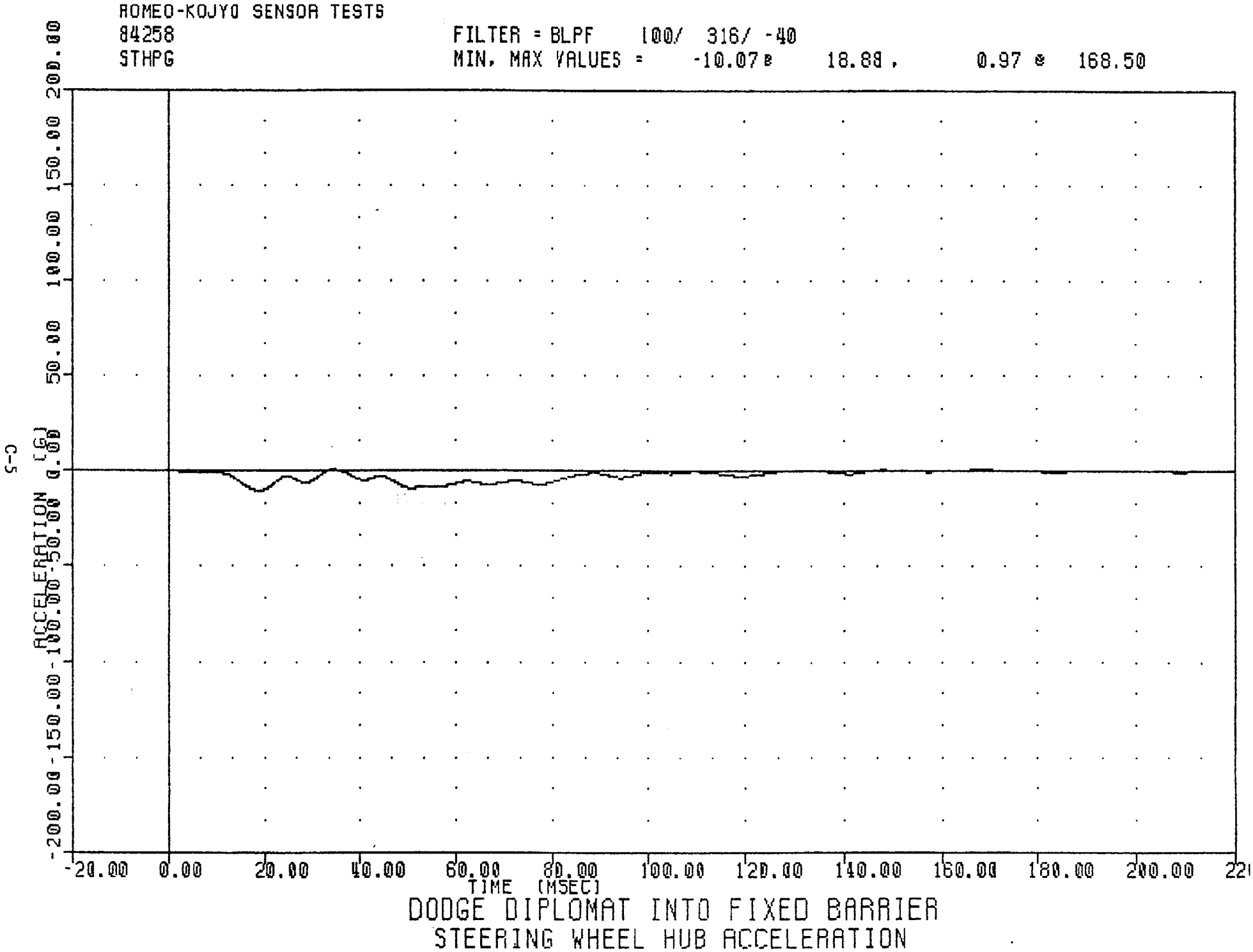
DODGE DIPLOMAT INTO FIXED BARRIER
LEFT FRONT FRAME X-MENBER ACCEL X AXIS



DODGE DIPLOMAT INTO FIXED BARRIER
RIGHT FRONT FRAME X-MEMBER ACCEL X AXIS

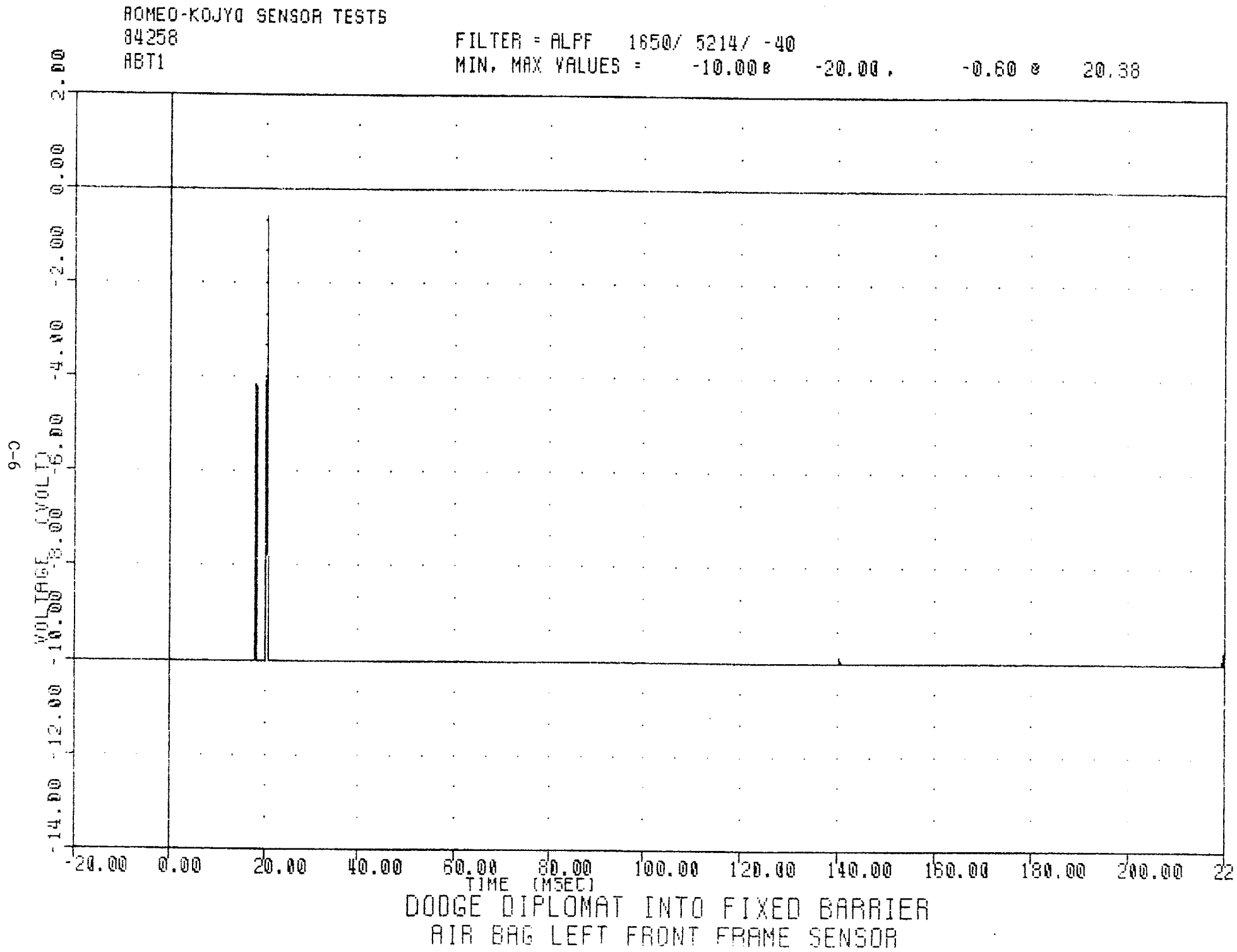


DODGE DIPLOMAT INTO FIXED BARRIER
FIREWALL ACCELERATION X AXIS



C-5

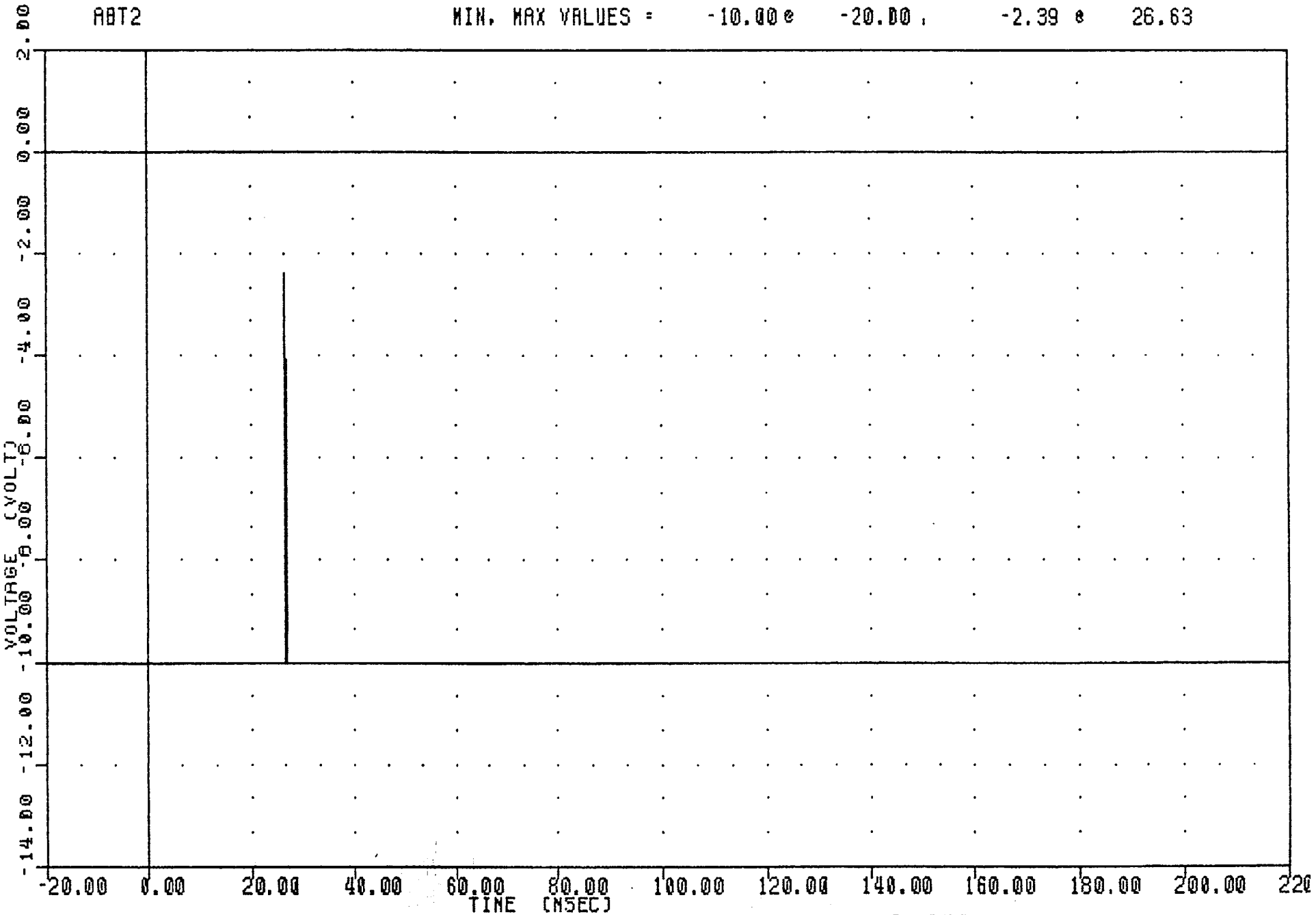
DODGE DIPLOMAT INTO FIXED BARRIER
STEERING WHEEL HUB ACCELERATION



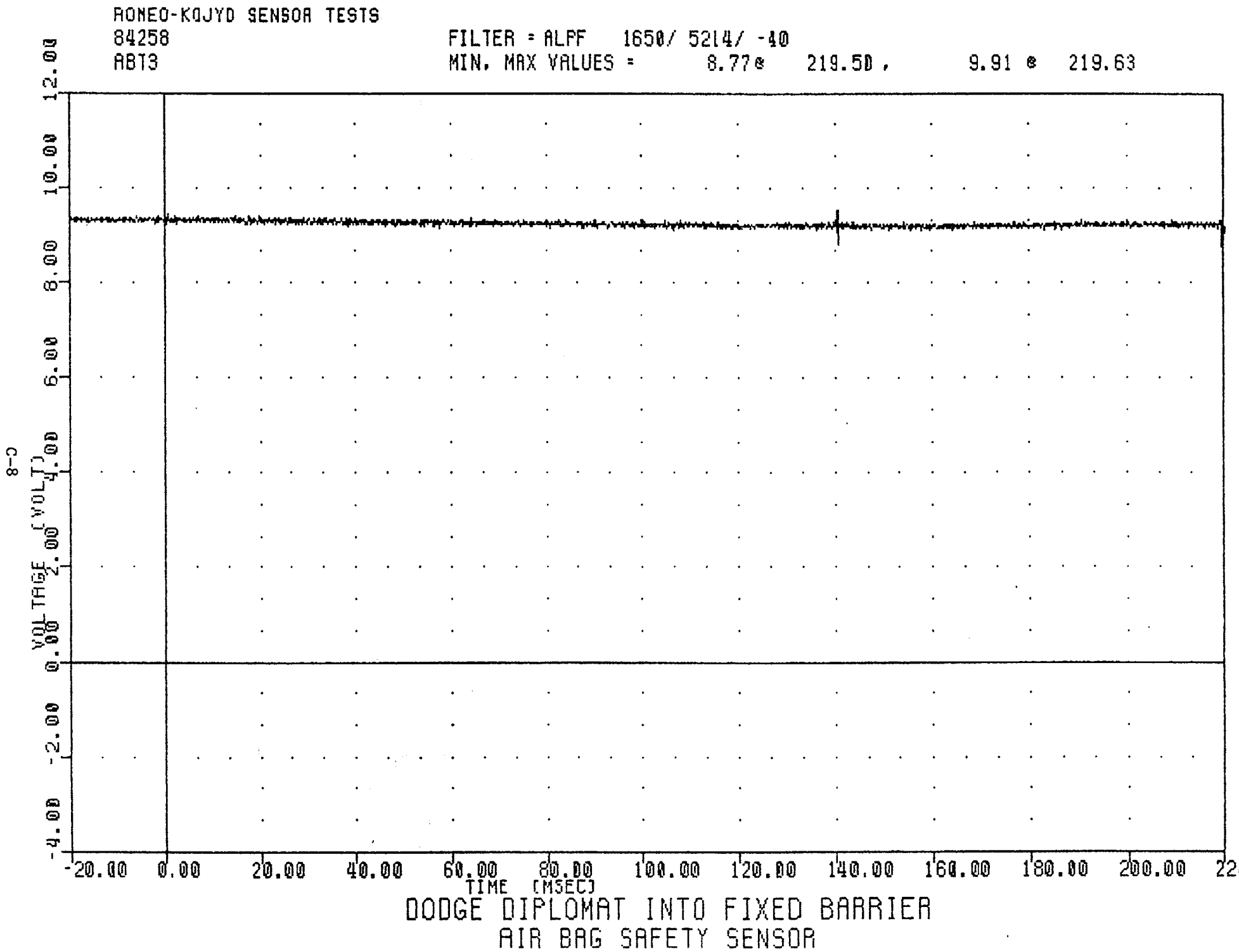
C-6

DODGE DIPLOMAT INTO FIXED BARRIER
AIR BAG LEFT FRONT FRAME SENSOR

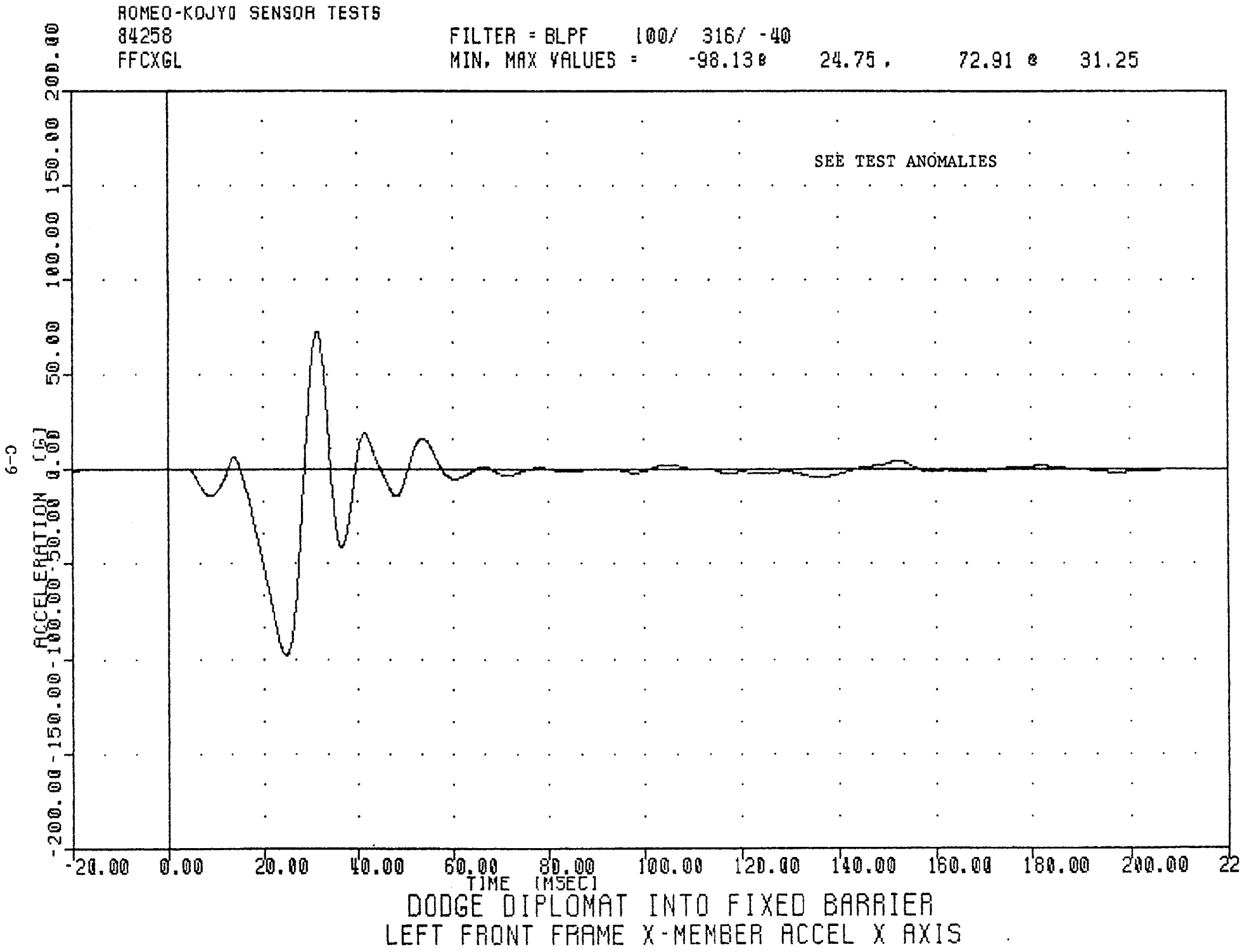
ROMEO-KOJYO SENSOR TESTS
84258
ABT2
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -10.00 @ -20.00 , -2.39 @ 26.63

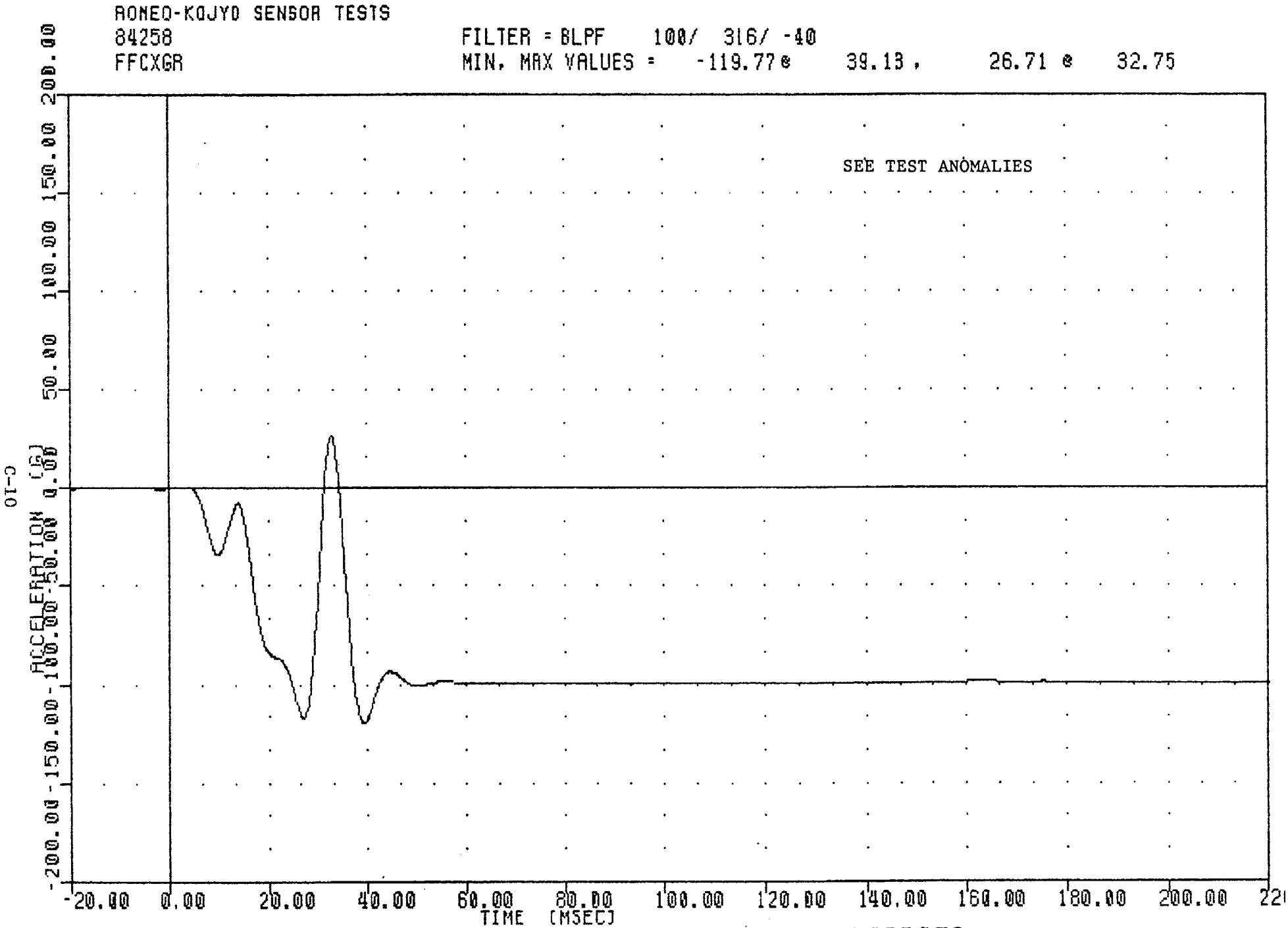


DODGE DIPLOMAT INTO FIXED BARRIER
AIR BAG RIGHT FRONT FRAME SENSOR

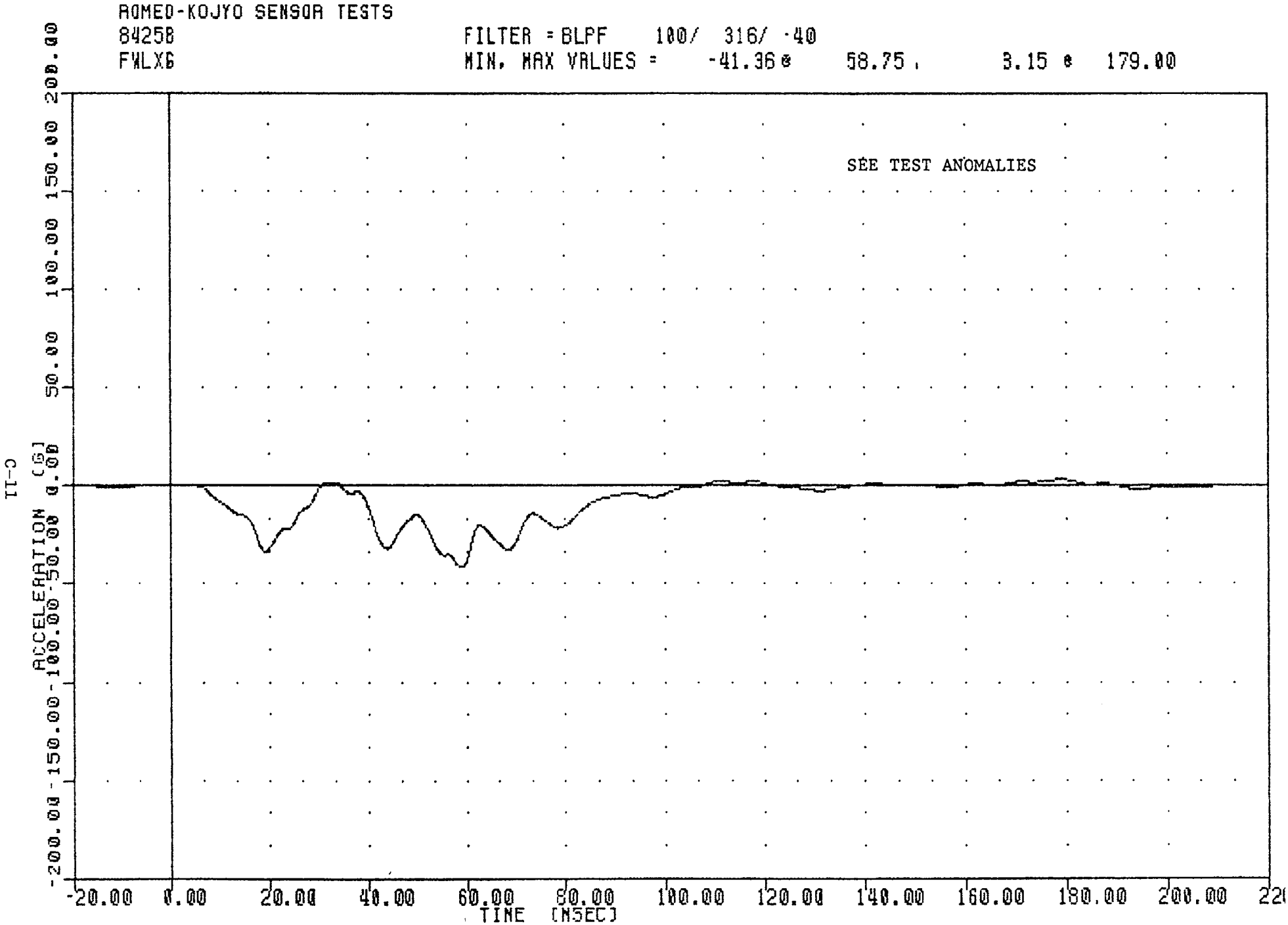


DODGE DIPLOMAT INTO FIXED BARRIER
AIR BAG SAFETY SENSOR

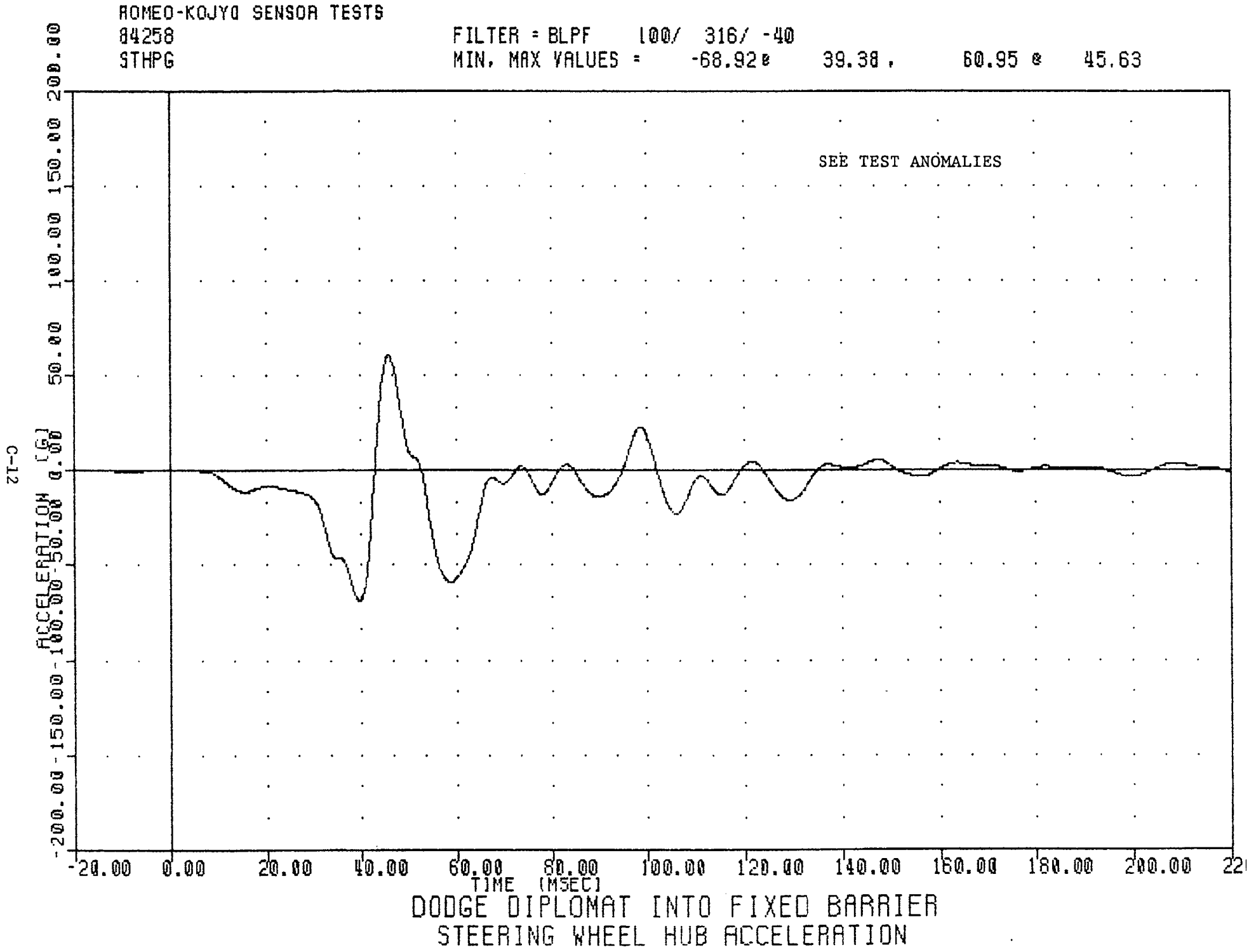

ROMEO-KOJYO SENSOR TESTS
84258
FFCXGL
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -98.13 @ 24.75 , 72.91 @ 31.25
SEE TEST ANOMALIES
ACCELERATION [G]
200.00
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
-200.00
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
TIME [MSEC]
DODGE DIPLOMAT INTO FIXED BARRIER
LEFT FRONT FRAME X-MEMBER ACCEL X AXIS

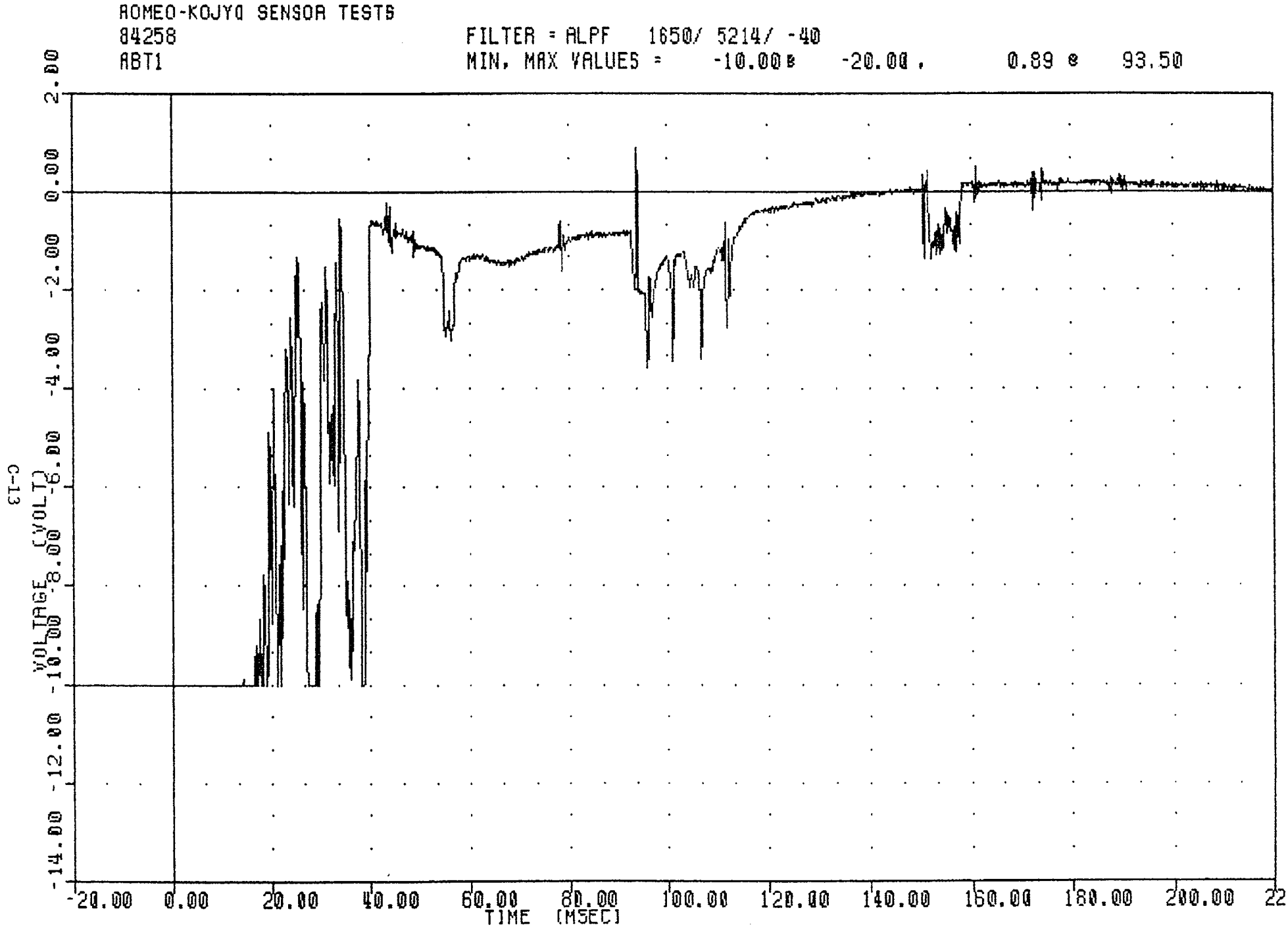


DODGE DIPLOMAT INTO FIXED BARRIER
RIGHT FRONT FRAME X-MEMBER ACCEL X AXIS

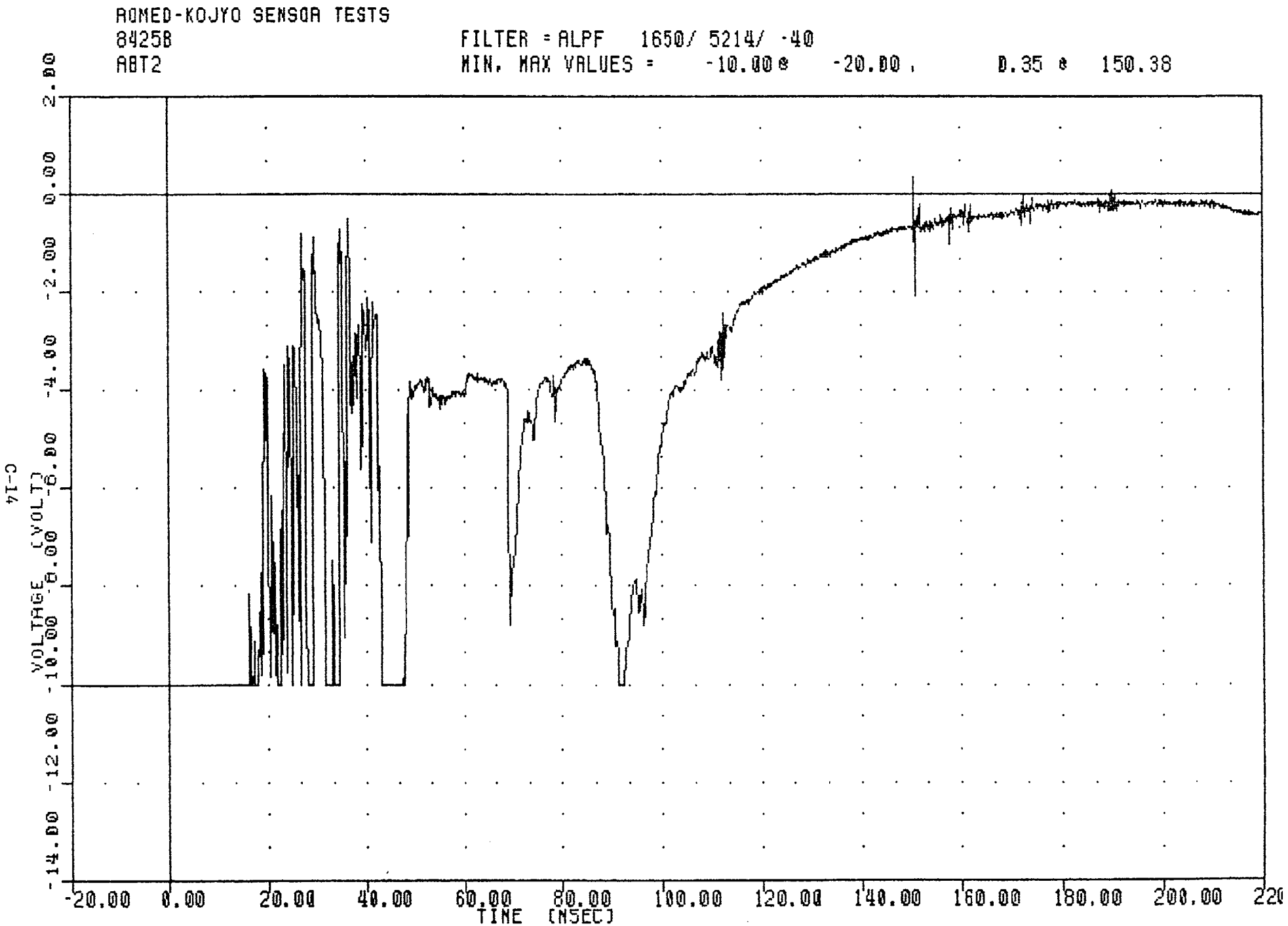


DODGE DIPLOMAT INTO FIXED BARRIER
FIREWALL ACCELERATION X AXIS

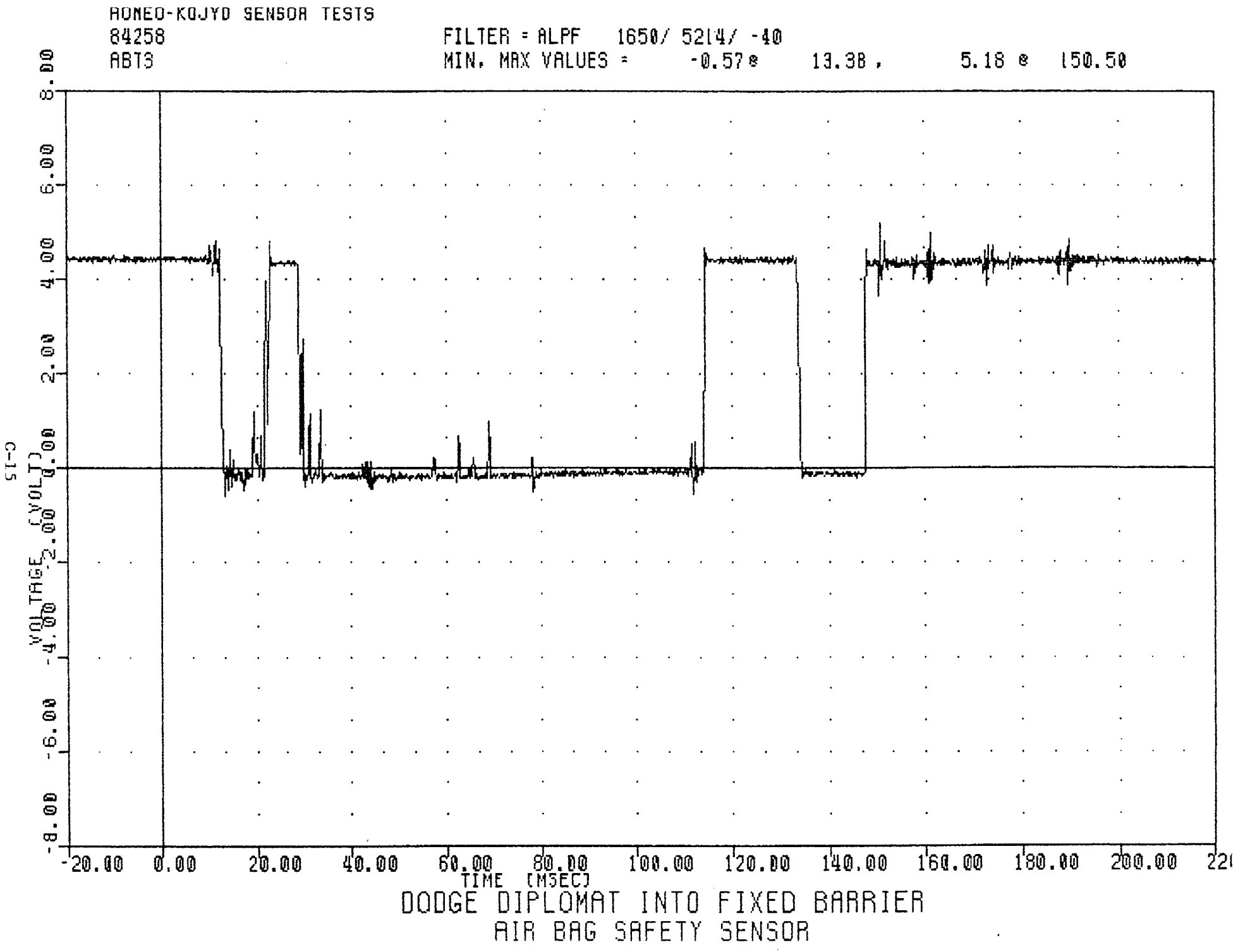

ROMEO-KOJYO SENSOR TESTS
84258
STHPG
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -68.92 @ 39.38 , 60.95 @ 45.63
SEE TEST ANOMALIES
ACCELERATION [G]
200.00
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
-200.00
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
TIME (MSEC)
DODGE DIPLOMAT INTO FIXED BARRIER
STEERING WHEEL HUB ACCELERATION



DODGE DIPLOMAT INTO FIXED BARRIER
AIR BAG LEFT FRONT FRAME SENSOR



DODGE DIPLOMAT INTO FIXED BARRIER
AIR BAG RIGHT FRONT FRAME SENSOR



DODGE DIPLOMAT INTO FIXED BARRIER
AIR BAG SAFETY SENSOR